Vol. 47 No. 4 April 1954

Quarterly

of the

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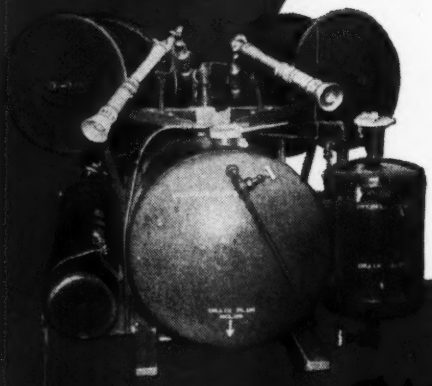

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Vol. 47 No. 4 April 1954

Quarterly

The Standard Technical Journal of Fire Protection for More Than Forty Years

The NFPA is a non-profit technical and educational organization devoted to the reduction of loss of life and property by fire with a total membership of 15,000. The *Quarterly* is one of the publications regularly provided to members. Other membership publications include a monthly *Fire News, Advance Reports* and *Proceedings* of the Annual Meetings, a *Year Book*, and many leaflets, pamphlets and posters issued throughout the year on fire prevention and control.

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National Fire Protection Association
International

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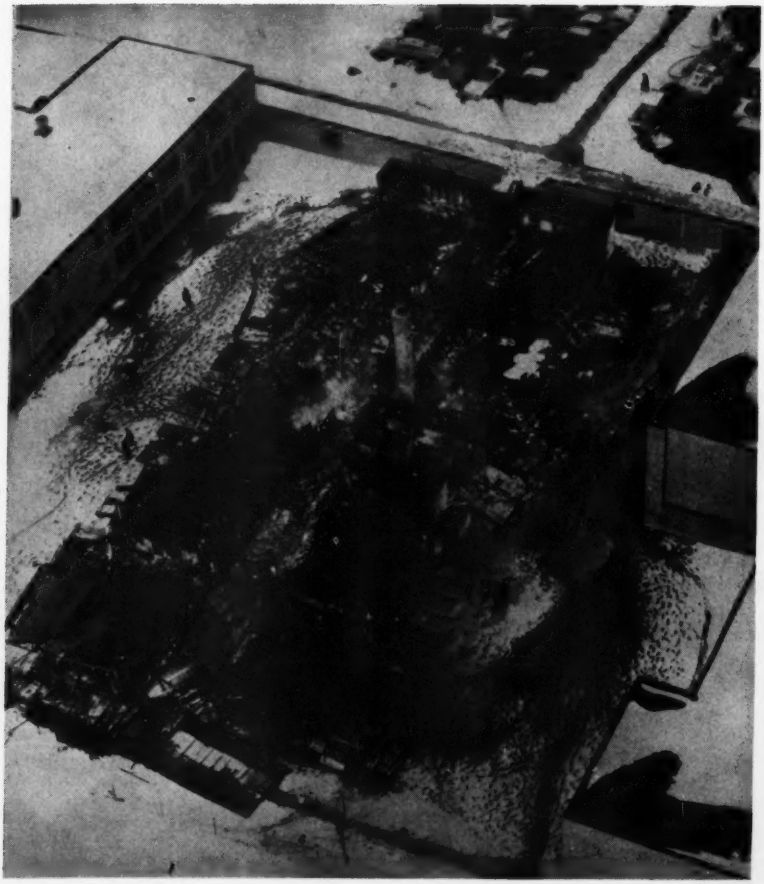


Wide World Photo

Fifteen children were fatally burned in this one-story school annex in Cheektowaga, N. Y. on March 31, 1954. Fire originated in the closed teachers' workroom (see smoke rising from room at left of chimney) and after burning through the wood panel door, flashed through the corridor and into the music room (diagonally across corridor) where 31 pupils, 2 teachers and a cap and gown salesman were located, the only occupants of the structure. Unable to enter the corridor, the terrified children, aided by the teachers, broke the glass in the windows of the room with their hands and plunged into the snow. White cloths (right of chimney) cover the bodies of ten children that were burned to death at the time of the fire. Five other children died of burns later in the hospital.

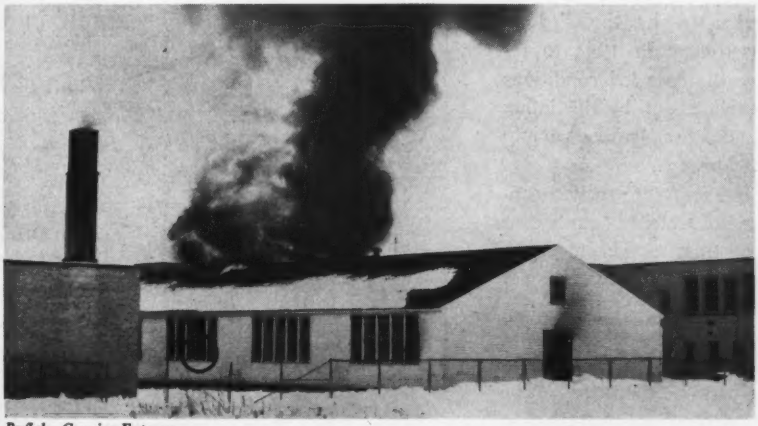
Flames Trap Fifteen in One-Story School

By Richard E. Stevens
NFPA Fire Record Department

Tragedy struck Cheektowaga, a fast-growing suburb of Buffalo, on March 31, 1954 when a flash fire swept through a one-story, eight room annex of the Cleveland Hill School and took the lives of 15 sixth grade children. Ten of this number burned to death at the time of the fire. Nineteen other children were burned or injured escaping through windows. One of the injured died of burns in the hospital on Thursday, April 1, three succumbed on Saturday, April 3, and the fifteenth victim died on Thursday, April 8. Of the total deaths to date, 9 were girls and 6 were boys, all aged 10 to 12 years.

The fire apparently originated in the teachers' workroom where stage properties were stored. Flames burned undetected until fire broke through the closed door of this room, flashed into the corridor and entered, through an open door, the music room (diagonally across the corridor) where 31 pupils, two teachers and a cap and gown salesman first saw the flames. It was impossible to escape through the corridor so the teachers broke windows in the room and pushed the children out into the snow until fire singed their clothes and burned their arms and necks. The teachers thought they had helped all the pupils out the windows before they themselves leaped into the snow. When firemen had extinguished the fire, 10 bodies were found near the windows in the music room, the only occupied section of the one-story school annex.

The cause of the fire is unknown at the present time. The rapid spread of flames is attributed to heat and gases that



Buffalo Courier-Express

Taken very early in the fire, this photo shows the extent of fire in the area of the music room. Note open window (circled) in the room of origin. Smoked area at the end of the building over the door probably is a result of the initial flash of fire through the corridor.

accumulated from the undetected fire before the flames broke through the workroom door. The rush of air through the windows, broken by the escaping occupants, and the combustible fibreboard ceiling increased the spread of fire into the music room. Fire also flashed both ways in the corridor providing further evidence of the presence of a large accumulation of hot gases.

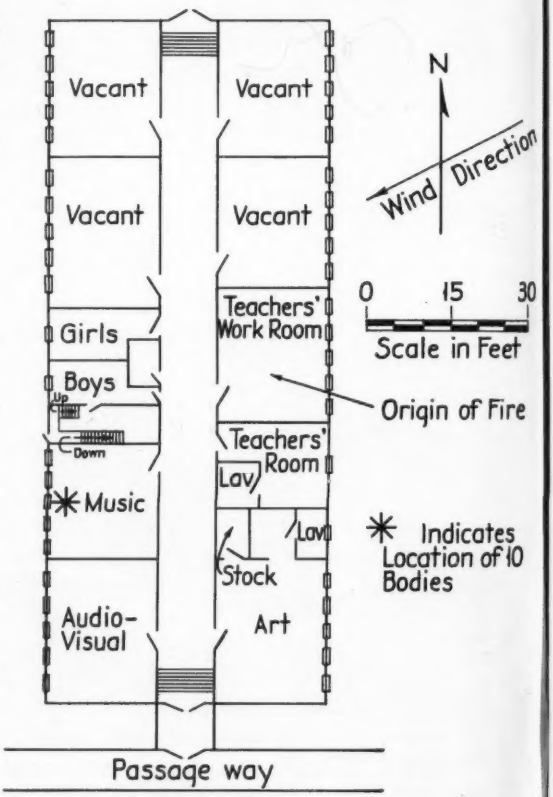
Whatever the cause, the delay in detection, the absence of automatic protection, the combustible ceiling and the presence of highly combustible contents in the room of origin have resulted in the first fatal school fire, according to the NFPA Fire Record Department, since 1947 when four boys were killed in Monroe City, Mo. high school.*

Construction

The one-story, 50 ft. by 120 ft. wooden building was constructed by the Federal Government in 1941 to relieve the crowded conditions brought about by the influx of defense workers into Cheektowaga.

The roof construction consisted of matched boards over wood trusses. The roof covering was asphalt shingles over asphalt building paper. Sidewalls were wood framing covered with matched sheathing and clapboards. The foundation wall was concrete block. Only the furnace room (15 ft. by 20 ft.) was excavated to full height. The remainder of the basement was excavated to a depth of 5 concrete blocks (about 40 inches).

As indicated in the floor plan below, the building contained 7 classrooms, a teachers' workroom, a teachers' room, 4 toilets and miscellaneous closets and storerooms. A 10 ft. wide corridor ran full length of the structure with two 3 ft. wide doors at each end. The door on the north end led outside; the door on



Floor plan of one-story annex of Cleveland Hill School. Since no architects plans were available, this plan is based on a sketch that appeared in the April 2 issue of the Buffalo Courier-Express and from an inspection of the ruins.

*Pan of gasoline ignited from welding sparks cut off escape from the only exit in the 1-room wooden building used for vocational training.

Buffalo Courier-Express

This photograph indicates the fire fighting handicaps due to the arrangement of buildings. Fire-resistive passageway connecting the school buildings is shown in the foreground.

the south end opened into a vestibule where double metalclad doors led to a fire-resistive passageway leading to other buildings. The metalclad doors were equipped with panic latches.

All ceilings were combustible fibreboard panels 4 ft. square. Walls were covered with plaster board and 1 in. by 6 in. wood wainscoting up to about 4 ft. from the floor. Walls in the boys' toilet were the only exception to this construction. These walls were plaster over gypsum lath. All floors were matched hardwood. The interior of the building was painted during the summer of 1953.

The attic was undivided. There was a ventilating louver on each end of the attic. Loose rock wool insulation was spread in the joist channels directly on the fibreboard ceiling.

Interior doors were of the wood panel type. Each classroom contained five double hung windows 3½ ft. by 8 ft., each with eighteen 12 in. by 18 in. panes of glass. The distance from the floor to the window sills was 40 inches.

Heat for the building was supplied by a coal fired, forced hot air heating system. The system contained automatic draft controls but the fan was turned on manually and shut off automatically when the thermostat was satisfied. One large metal duct extended from the furnace to the attic and the full length of the attic where branch ducts fed the individual rooms. Manually operated dampers were distributed through the main duct so that any portion of the duct could be closed off. Sheet metal return air ducts led from the floor near the classroom windows directly to the furnace.

Manual fire alarm boxes actuating a school fire alarm system were provided in the passageway running between the buildings. Fire department notification was by telephone to the police department, who in turn sounded the town fire horn.

The Fire

At 11:35 A.M., Wednesday March 31, Mrs. Melba Seibold, a teacher, and Miss June Mahany, a practice teacher, were conducting a music class of 31 pupils in the music room of the wooden annex. A salesman, also in the room, was removing gowns from a box and hanging them in a closet; no other room in the building was occupied. The door leading to the corridor from the music room was open. The salesman remarked that it was very warm in the room and removed his suit coat. Minutes later flames and smoke flashed through the door of the teachers' workroom diagonally across the corridor. Panic immediately developed and some children ran for the open door but were met with flames and smoke that flashed into the music room. Other children in the music room ran to the windows and broke the glass with their hands and crawled or were pushed out. With heat burning their faces, arms and legs, the teachers helped all the pupils out that were at the windows and thinking that all children were out, leaped to the ground. Apparently the children who tried to leave by the door, although stopped by the teachers, were the 10 children who did not escape. The salesman assisted in evacuating the children and then plunged out a window. Only two of the occupants escaped injury. A child entering the corridor from the passageway was met with a blast of fire that burned his face and hands. He turned and ran back into the passageway, leaving the metal clad doors open behind him.

Wide World Photo

Firemen pour water through the windows of the music room where ten children were burned to death. Note the extent of fire in this room as compared with the adjacent room. The large heavy windows (sills 40 inches from the floor) were not raised. The window panes were broken by the escaping children, teachers and salesman.

When the fire was discovered by teachers in adjacent school buildings, the local alarm was sounded and the alarm telephoned to police headquarters. Some teachers and the principal attempted to enter the burning structure, but were driven out by heat and smoke. Firemen of the Cleveland Hill Volunteer Fire Department were having their weekly practice drill a few blocks from the school and responded quickly to the town fire horn alarm. Long hose lines were laid from the street to surround the burning structure. When flames had destroyed the roof of the building, the exterior wall of the music room collapsed exposing the bodies of ten children on the floor of the room near the windows. Before extinguishment was completed, the entire wooden annex was destroyed but firemen prevented flames from entering the exposed main school building (30 ft. distant) and stopped the spread of fire into the passageway. Some breakage of glass blocks in the main building was the only visible exposure damage.

Discussion

The heroism of Mrs. Siebold and Miss Mahany is certainly to be commended. According to newspaper accounts of eyewitnesses' testimony, particularly the salesman, flames flashed into the room igniting all combustible materials such as papers on the bulletin board, books, music, etc. Children ran screaming to the windows and towards the open door. It took tremendous courage and determination to direct the frenzied children towards escaping through the windows. Teachers in adjacent school buildings soaked their clothes with water and futilely attempted to enter the burning structure. Principal Irvin Restorff repeatedly attempted to gain entrance into the building without success. It seems fitting that courage such as displayed by these individuals be recognized in this report.

Those present indicate that fire was first seen coming through the closed door of the teachers' workroom. The investigation of the ruins indicates that the only place the floor was burned through was in the workroom adjacent to the corridor wall. This verifies the statement that the fire originated in the teachers' workroom. The room contained stage properties that were being painted with water base paint preparatory to a play that was to be given soon. It is reported that boys had been painting the properties on the morning of the fire. Whether the room contained other than water base paint is unknown at the present time. Several 5 gallon cans were found in the charred remains of the room and are being tested to determine, if possible, their original contents.

There was no evidence of any fire damage to the furnace room. The furnace appeared to be in good condition and there was no visible indication that the duct system had any bearing on the spread of fire.

The actual ignition source is unknown. It is believed that fire burned undetected in the room of origin for some time obtaining oxygen from a partially open window (see photo page 331), and built up a considerable amount of hot gases and unburned products of combustion. When flames finally burned through the wood

Wide World Photo
Firemen inspect the charred remains. The bodies of ten children lay beneath the white cloths. One of the bodies fell out with the exterior wall of the music room.

panel door, the pressure of the hot gases and the draft from the open window (direction and velocity of wind evident from photographs) drove flames and smoke into the corridor and the music room where the children were located. Combustion of the hot unburned gases progressed instantaneously. The flame front where the rapid oxidation occurred may be ascribed to the initial flash of fire and the continued rapid burning attributed to the fibreboard ceiling and the combustible contents such as papers and books. When the occupants broke the windows, an additional draft was created that further influenced the spread of fire into the music room. Newspaper reports of a dull explosion heard by neighbors and occupants of other sections of the school may be attributed to this initial rapid combustion of unburned gases.

Until December, 1953 the entire building was used for classes and housed about 240 children. There is the possibility that this school, if fully occupied for classroom purposes, in accordance with the original purpose of its design, might well have had a fire without any loss of life or injury to the children. If every room had been in use any fire should have been discovered in time for safe evacuation of the building under regular fire drill procedures, before the fire had developed to dangerous proportions, despite the combustible fibreboard ceiling. Actually, however, one room was used for the storage of combustible materials without any of the standard safeguards, such as fire-resistive walls and ceilings, with fire doors on doorways to other parts of the building, automatic sprinkler protection, or automatic fire detection equipment.

Conclusions

The most significant factor in this fatal fire was the delayed detection. If the fire had been discovered in its incipient stages the children could have left the building and the fire would probably have been extinguished with small damage. An automatic fire detection

Editor's Note

A secret investigation into the cause of the fire is being carried out by the District Board of Education. A similar probe is being conducted under the direction of the District Attorney of Erie County. Since the Board does not include any persons experienced in the fire protection and prevention field, it seems doubtful that any additional useful information would be developed by the Board that would improve on the information in this report. It is also unlikely that the NFPA would be able to obtain any facts from the District Attorney's investigation. This statement is based on past experience with the District Attorney of Erie County in connection with a secret investigation on the fatal explosion at the Lucidol Division of Novadel-Agene Corp. in Town of Tonawanda, N. Y. on Sept. 23, 1953 (see page 240, January 1954 **Quarterly**). To date the NFPA has received no reply from the District Attorney to our request for information on his investigation into that fatal explosion.

The residents of Cheektowaga are much disturbed about the closed door policy of the Board of Education. The chief of the Cleveland Hill Volunteer Fire Department (the chief who directed fire-fighting activities at this fatal fire) is concerned because he has not been asked to serve with the board during the investigation nor has he been consulted at any time.

The April 1 issue of the Buffalo Evening News sums up the situation in the following quotation: "Sharp criticism is in order, however, for the veil of secrecy drawn by the District School Board as it launched its investigation of the tragedy. Whatever the board's reasons, the effect of such an unjustified closed door policy is to raise suspicions or doubts about the adequacy of the probe. Every citizen, not only in Cheektowaga but everywhere else, has a right to the fullest possible information on the course of the investigation now under way."

system operating both a local alarm bell to warn the occupants of the school and the town fire horn, or an automatic sprinkler system that would supply both the local alarm service and extinguishment, might well have averted the tragedy.

Whether the building construction, with the exception of the fibreboard ceiling, was a major factor in the loss of life is doubtful. A similar occurrence with the same fire conditions could have taken place in a fire-resistive building lacking automatic protection and with a combustible ceiling, wood panel doors and combustible contents.

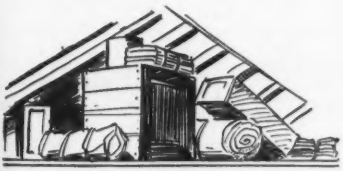
A great many of the one-story school buildings that have been built recently have outside exits in each classroom. Had there been an outside exit in the music room of this building the children might have escaped the fire without injury.

This was a wood-frame building with wooden exterior walls, the type of construction often tagged as "fire trap" by the general public. However, no parents or teachers should be lulled into complacency because their schools have brick or stone outside walls, since the material of construction of the outside walls of a building has little influence on the safety of the people inside, and some of the worst real "fire traps" are camouflaged by substantial looking brick or stone shells enclosing the "built-to-burn" interior.

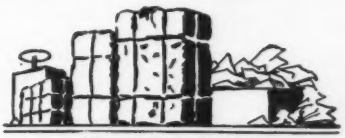
Automatic Sprinklers for Schools

The NFPA has standards for school fire safety in the Building Exits Code, which applies to both new and existing buildings, covering such features as alarm systems and fire exit drills in addition to exits and related features of construction. In existing buildings, where all the safety features of new construction are not practicable, a high degree of safety may be secured through automatic sprinklers, which are found in many schools today. The following illustrations and their captions are extracted from the NFPA leaflet "Automatic Sprinklers for the Fire Trap School."

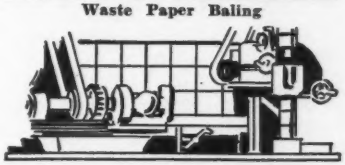
There are lots of things about a school to make quick, hot and smoky fires, and these things will be there no matter how "fireproof" you think the school.



Storage Rooms

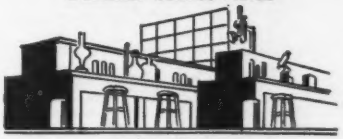


Waste Paper Baling



Shops

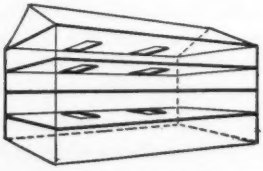
Domestic Science Room



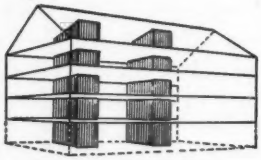
Laboratories

The school may also be a fire trap because of its arrangement.

Fire can travel from floor to floor through stairways and other vertical openings.

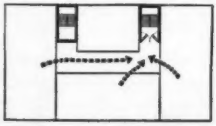


In a fire trap school, fire can spread unhindered from floor to floor and from one end of the building to the other.



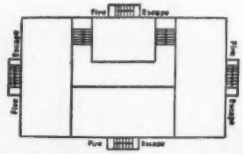
Enclosing the stair shafts and other vertical openings holds a fire to one floor of the building and safeguards the ways of escape.

All stairways should be properly enclosed with substantial partitions and self-closing doors.



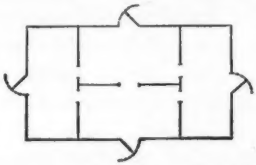
An enclosure around a stairway holds a fire until people can get out by other exits.

If the only available stairs are to be cut off in case of fire, other means of exit must be provided. One of these is to provide fire escapes — stairs on the outside of the building.



It takes a lot of fire escapes to make a building with open stairways safe. Fire escapes are a make-shift at best. They are dangerous to use.

One-story schools may be arranged to have no appreciable hazard to life from fire.

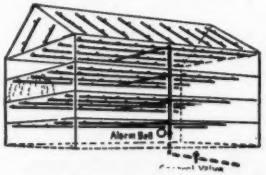


All rooms of a one-story school can be arranged with exits direct to the outside.

The surest way to keep fires small is to equip the building with an automatic sprinkler system. This consists of pipes along the ceilings by means of which water is carried to every part of the building.

A fire will melt fusible members of sprinkler "heads" and release the water to put out the fire.

Automatic sprinklers offer a practical means of offsetting the hazard of combustible building material. If any substantial part of the building is of combustible construction, this alone is justification enough for sprinkler protection.



In addition to promptly attacking a fire, the sprinkler system is arranged to give an alarm to warn the occupants of a building (arrangements to report alarm at a supervisory central station or to fire department may be made).

The fire protection engineer sees the construction of an ordinary school building like this:

Here's the only part which will not burn—the outside brick shell.

A Case For Fire Casualty Statistics

By Chester I. Babcock
Secretary, NFPA Committee on Fire Casualty Statistics

What were the principal causes of fire casualties in your city last year, chief? How many people were killed,—how many injured? Can you put your finger on those particular contributing factors that showed up most frequently in these casualties? What were the reasons behind the injury record of your fire fighting force? Most important of all, can you quote chapter and verse from the fire experience of your community to justify the fire safety requests you make of your townspeople? These are some of the questions that fire casualty statistics will answer.

Fire casualty statistics are the concern of everyone interested in reducing the annual record of some 12,000 deaths and 85,000 injuries from fire, but to the fire officials on whose shoulders rest the fire safety of their respective communities, fire casualty statistics are essential. They take the guessing out of fire safety programs and are the backbone of every effective effort to date to reduce the number of deaths and injuries from fire.

This article contains several tables analyzing the 1,079 fire casualties, including 155 fatalities, that occurred in the city of Chicago in 1952. The statistics were made available to the NFPA through the cooperation of Chief Frank McAuliffe and Assistant Chief Frank Tinney, of the Chicago Fire Insurance Patrol, and are set forth here as graphic illustrations of the types of statistics that any city can develop.

To assist fire officials to gather useful statistics on fire casualties uniformly and with a minimum of effort, the NFPA Committee on Fire Casualty Statistics has defined a fire casualty,* and has prepared a Report Form on which the most important information pertaining to a casualty can be recorded.† The Definition and Report Form were used to compile the Chicago experience and are currently being used by many other fire officials to record their fire casualty experience.

There are several types of statistics that can be compiled on fire casualties and those most useful in Chicago may not necessarily be of equal importance in another city. As will be noted in the accompanying tables, hotel fire casualty experience is classified separately. In a convention city such as Chicago, with hundreds of hotels, such experience is of vital importance to fire officials and others responsible for life safety of the public, whereas hotel experience probably would not require separate analysis in a city having one or two hotels.

Fires Causing Casualties

In any program to reduce the number of fire casualties, primary emphasis must be placed on the elimination of fires that are the most frequent cause of injuries. How can a community's fire safety program expect to eliminate such fires if they have not been identified?

Table 1 classifies the 472 casualties suffered by the public at fires** in Chicago in 1952 according to the cause of fire.

*NFPA No. 3, *Definition and Classification of Fire Casualties,* available in pamphlet form from the National Fire Protection Association, Boston, 10, Mass.

†Sample copies available from the NFPA. A supply of Forms will be made available without charge to anyone who will assist the Fire Casualty Statistics Committee in its project to collect statistics on fire casualties. See description of this project, page 346.

**There were also 602 casualties to firemen, and five casualties to the public caused by fire apparatus accidents; total: 1079.

Table No. 1 Casualties Classified by Cause of Fire and by Occupancy*

	Dwellings	Rooming Houses	Hotels	Public Assembly	Manufacturing Plants	Stores	Garages	Miscellaneous Buildings	Outdoor Fires	Motor Vehicles	Totals
Heating Equipment, Defective, etc.	60	2	0	0	0	0	2	1	0	0	65
Oil Stoves, Appliances (not Portable)	30	1	..	..	..	..	..	1	..	..	32
Oil Stoves, Appliances (Portable)	5	1	..	..	..	..	..	..	..	..	6
Coal Stoves, Appliances	5	..	..	..	..	..	1	..	..	..	6
Furnaces	3	..	..	..	..	..	..	..	..	..	3
Gas Stoves, Appliances	12	..	..	..	..	..	..	..	..	..	12
Misc., Unknown Equipment	5	..	..	..	..	..	1	..	..	..	6
Smoking and Matches	54	8	8	0	0	1	0	0	3	0	74
Fell Asleep While Smoking	33	7	8	..	..	1	..	..	..	..	49
Other Careless Smoking	21	1	..	..	..	..	..	..	3	..	25
Flammable Liquids, Misuse of	17	3	0	0	14	0	8	8	2	6	58
Gasoline	2	..	..	..	2	..	8	5	..	..	17
Paint, Paint Remover	5	2	..	..	1	..	..	..	..	..	8
Grease, etc., on Stove	5	1	..	..	1	..	..	1	..	..	8
Miscellaneous	5	..	..	..	10	..	..	2	2	6	25
Incendiary, Suspicious	10	1	3	11	0	0	0	0	0	0	25
Electricity, Misuse of	12	2	0	0	1	1	0	1	0	1	18
Fixed Services	5	2	..	..	1	1	..	..	..	..	9
Appliances	7	..	..	..	..	..	..	1	..	1	9
Explosions, Except Fireworks	1	0	1	24	7	0	1	1	3	3	41
Mfrd., Natural, LP Gas	1	..	1	..	..	..	..	..	2	..	4
Flammable Liquid Vapors	..	..	..	..	..	..	1	1	1	3	6
Miscellaneous	..	..	..	24	7	..	..	..	..	..	31
Improper Rubbish Disposal	17	1	0	0	0	2	0	1	0	0	21
Children and Matches	6	4	0	0	0	0	1	0	2	3	16
Welding Sparks, etc.	0	0	0	0	2	0	0	0	1	0	3
Fireworks	2	0	0	0	0	0	0	0	2	0	4
Open Fires	20	0	0	0	0	2	0	4	9	0	35
Candles, Torches	6	..	..	..	..	1	..	4	..	..	11
Grass	..	..	..	..	..	..	..	..	9	..	9
Stove Flames	14	..	..	..	..	1	..	..	..	..	15
Unknown	37	51	13	0	1	8	0	2	0	0	112
Totals	236	72	25	35	25	14	12	18	22	13	472

*The casualties analyzed here were suffered by the public at fires. This table does not include 549 casualties to firemen at fires (See Table 4), 53 casualties to firemen responding to or returning from fires (see Table 5), and five casualties suffered by the public resulting from accidents involving fire apparatus.

Note the wealth of material in this table useful for fire prevention talks, newspaper articles, inspection programs and safety regulations. In Chicago in 1952, careless smoking was the number one offender, being responsible for 74 casualties. Defective heating equipment was second with 65 casualties, and misuse of flammable liquids was responsible for 58. These figures in themselves, although throwing some light on the problem, are of limited value unless they are subdivided to indicate what facet of careless smoking was most dangerous, what types of heating equipment were involved, and what flammable liquid fires most frequently caused casualties. Table 1 gives this information. In Chicago they were: falling asleep while smoking, defective or overheated nonportable oil burning appliances, and misuse of gasoline. Here are definite and specific hazards (substantiated by factual experience) around which the fire prevention program can be built.

It is unlikely that the experience in a given city will be the same from year to year, or that experience in any two cities will be alike, and, for that reason, it is important that every community keep its own records. In the southwest, for example, gas stoves are more widely used and thus may be more frequent causes of casualties than oil stoves. Use of flammable liquids to kindle wood stove fires may well be the most common flammable liquid hazard in certain southern areas. Fire hazards are influenced by many variables and even the experience in adjoining communities can be quite different.

The list of causes, while not all-inclusive, is in sufficient detail for most purposes. It should, of course, be tailored to fit the needs of an individual community. The fireworks problem, for example, was still with Chicago in 1952 when five casualties* and 17 fires were attributed to this cause. In many cities, restrictions on use of fireworks have eliminated fireworks fires and injuries.

Table 1 contains several illustrations of the importance of classifying fire casualty experience by occupancy. As previously indicated, over-all experience pointed to careless smoking, heating equipment defects and misuse of flammable liquids, in that order, as the three most frequent causes of fires involving casualties. Experience of specific occupancies, however, differs considerably as will be noted by comparing the experience in dwellings, garages, places of assembly and manufacturing plants. As in the case of fire causes, the list of occupancies should be adjusted to suit local conditions.

Contributing Factors

Fire prevention programs can do much to reduce fire casualties but at present, at least, they are not enough. Although good fire prevention programs have eliminated many needless fires and resultant casualties, the ideal of complete fire prevention has by no means been attained. A fire prevention program must be complemented by a program to protect the lives of the public if fire does break out.

Table 2 is a sample of useful statistics that can be taken from fire casualty reports to indicate what steps, educational or regulatory, should be taken to protect the lives of the public at time of fire. The incidences of panic, inadequate exits, delayed detection, children left unattended and the other contributing factors extracted from the fire casualty records are clear-cut signposts to ways to reduce fire casualties. Some of them can be corrected by education, some by regulation, but in either case, the need for the correction is on sure ground and public acceptance is more likely if the need is based on irrefutable statistics.

The factor contributing to fire casualties that recurred most frequently was "Trapped by explosion and rapid spread of fire." Included in this category are

*In addition to the four fireworks casualties suffered by the public listed in Table 1, one fireman was injured fighting a fire started by fireworks.

Table No. 2
Factors Contributing to Casualties*

Contributing Factors	Dwellings	Rooming Houses	Hotels	Public Assembly	Mfg. Plants	Stores	Garages	Misc. Bldgs.	Outdoor Fires	Motor Vehicles	Totals
Panic	5	5	2	.....	.....	.....	.....	.....	.....	.....	12
Inadequate Exits	37	45	8	10	.....	5	.....	.....	.....	.....	105
Trapped by Explosion, Rapid Spread of Fire	120	8	5	24	20	2	11	10	8	7	215
Delayed Detection	79	49	18	.....	.....	7	.....	.....	.....	.....	153
Children Left Unattended	16	4	.....	.....	.....	.....	.....	.....	7	1	28
Bedridden, Other Physical Handicap	27	3	2	.....	.....	.....	.....	4	1	.....	37
Intoxicated	6	2	6	.....	.....	2	.....	.....	3	.....	19
Entered or Remained in Bldg. to Rescue Someone	8	2	2	.....	3	4	1	3	.....	.....	23
Entered or Remained in Bldg. to Fight Fire	7	1	.....	.....	.....	1	.....	1	.....	.....	10
Entered or Remained in Bldg. to Secure Valuables	1	.....	.....	.....	2	.....	.....	.....	.....	.....	3
Other Contributing Factors	9	2	.....	1	.....	.....	.....	.....	3	5	20
Totals	315	121	43	35	25	21	12	18	22	13	625

*One contributing factor was tabulated for each casualty except that for those casualties in which delayed detection was a factor, delayed detection and one other predominant factor was tabulated.

many casualties caused by fast-spreading, flammable liquid fires, by fires that originated with ignition of wearing apparel, and casualties caused by explosions.

The second most frequent contributing factor was delayed detection of fire, confirmation of the fact developed by other studies of fire casualties that a large percentage of fire deaths and injuries could have been averted had some means been provided for prompt fire detection and control. Statistics developed on delayed detection can be used to emphasize the importance of automatic protection.

Combustible Wearing Apparel

A factor not tabulated but one that is recognized as having a major influence on the fire casualty record is carelessness with combustible wearing apparel. Of the 472 casualties in Chicago in 1952, clothing was the first combustible material (and often the only one) ignited in 77 instances. These items of apparel were not of the dangerously flammable "torch sweater" variety, as far as could be determined, yet 77 fires involved shirts, kimonos, bathrobes and other clothing because someone carelessly backed against an oil stove, fell into a bonfire, dragged a housecoat sleeve across a gas stove flame or in some other way ignited a garment. Federal legislation designed to eliminate dangerously flammable wearing apparel from commerce will have no effect on this type of fire. As in Chicago, fire casualty records of many communities will undoubtedly show the need to emphasize that just about any wearing apparel will burn if the wearer is not careful in the presence of a source of ignition.

Age and Sex of Casualties

Have you ever wondered just what segment of the population of your community should receive special attention? Is any one age group or sex more susceptible to fire casualties than others? In other words, at whom should the fire safety program be directed to be sure that it falls on fertile ground? The 1952 fire casualty experience in Chicago seemed to be quite definite on this point,

Table No. 3
Age, Sex of Persons Suffering Fire Casualties*

Occupancies	Sex	Age Groups 0-4	5-14	15-24	25-34	35-44	45-54	55-64	65 and over	Totals
Dwellings (1-, 2-Family)	M	14	4	4	13	11	7	9	17	79
	F	12	5	4	8	8	5	5	8	55
Dwellings (More than 2-Family)	M	6	2	.....	10	6	10	6	12	52
	F	1	5	4	7	11	11	7	4	50
Rooming Houses	M	6	3	4	7	8	9	3	2	42
	F	3	1	2	6	6	5	5	2	30
Hotels	M	.....	1	3	4	3	2	1	1	15
	F	.....	1	2	4	1	1	.....	1	10
Public Assembly	M	.....	4	10	2	3	5	.....	.....	24
	F	.....	3	5	.....	1	1	.....	1	11
Manufacturing	M	.....	.....	2	5	4	7	5	2	25
	F	.....	.....	.....	.....	.....	.....	.....	.....	.....
Stores	M	.....	.....	2	2	3	2	3	.....	12
	F	.....	.....	.....	1	.....	1	.....	.....	2
Garages	M	.....	.....	.....	3	2	6	1	.....	12
	F	.....	.....	.....	.....	.....	.....	.....	.....	.....
Misc. Buildings	M	1	.....	.....	5	4	5	.....	.....	15
	F	3	.....	.....	.....	.....	.....	.....	.....	3
Outdoor Fires	M	.....	4	3	3	3	.....	3	1	17
	F	1	3	.....	.....	.....	.....	.....	1	5
Motor Vehicles	M	.....	.....	2	5	3	1	.....	1	12
	F	1	.....	.....	.....	.....	.....	.....	.....	1
Totals	M	27	18	30	59	50	54	31	36	305
	F	21	18	17	26	27	24	17	17	167

showing that males suffered almost twice as many casualties as females and that in the case of both men and women, most casualties occurred between the ages of 25 and 55. This was the record of one city in one year. It will be a dangerous assumption that all cities show the same experience. Studies of casualties should be made in each community, and reported annually to determine the effectiveness of corrective measures.*

Conclusions based on statistics can be misleading unless factors behind the statistics are understood. For example, does Table 3 suggest that perhaps children do not need as intensive training in firesafe living as their parents? The relatively few casualties among children might lead us to this conclusion, were it not recognized that the intensive firesafety training school children receive was undoubtedly one of the most important reasons that children of school age suffered so few casualties.

Injuries to Firemen

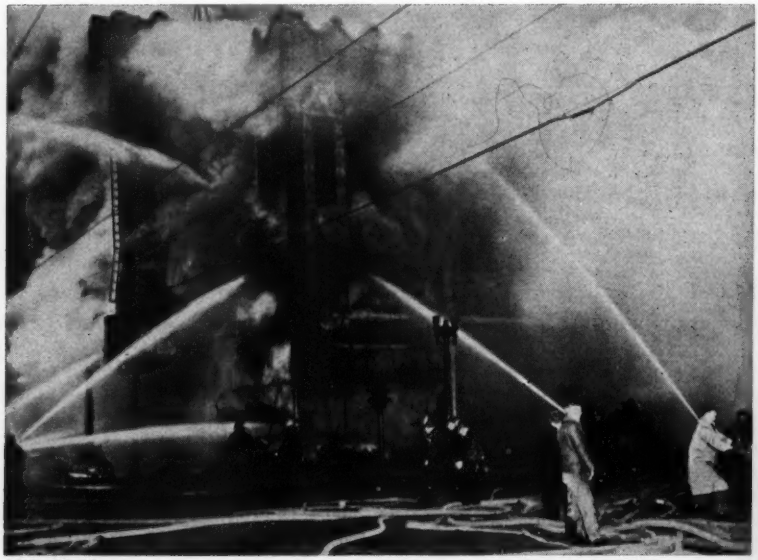
Firemen suffered more fire casualties than the public in Chicago in 1952. The 599 non-fatal injuries and three fatalities are just as much a part of the fire casualty experience of the city as are casualties to the public since by standard definition, a fire casualty is an injury or death resulting from a fire. Thus, the 1,079 casualties in Chicago in 1952 include injuries and deaths to firemen.

It is not surprising that firemen are frequent fire casualties because their profession requires repeated and sometimes extended exposure to the hazards of fire. There are also certain so-called occupa-

*Analyses of nationwide fire deaths by age group, based on statistics supplied by the National Office of Vital Statistics, are available in two Quarterly Reprints: "Fire Casualty Statistics" (No. Q 45-2) 25 cents; and "Teaching Children Fire Prevention" (No. Q 47-1) 25 cents.

tional activities associated with fire fighting, such as ladder climbing, pole sliding and hose handling that can result in injuries if not properly done. Whatever the cause of the casualty, the end result is usually a fireman on sick leave and with the attendant physical discomfort to the victim, medical expenses to be paid by the community and a decrease in over-all efficiency of the fire department while the fire fighting force is undermanned.

Proper training and equipment, however, can do much to protect the fireman against the perils of his work. A study of the fire casualty records of the fire fighting force can be of tremendous importance as a means of measuring the adequacy of training programs and protective equipment. Casualty statistics also will point to those features of training programs dealing with safety that need to be stressed in refresher courses.



Wide World

Delayed detection, inadequate exits and unsuccessful rescue efforts were among the factors contributing to the 12 casualties (six fatal) resulting from this furniture store fire in Chicago, Dec. 29, 1952.

The fire is believed to have originated above the suspended ceiling in the second story of the 3-story building. No one was in the second story, there was no automatic protection and consequently the fire was not discovered promptly and the building was not evacuated promptly of its 16 employees and few customers.

Nine minutes after smoke was first smelled (no alarm was transmitted), two explosions blew out windows and alerted firemen in their station in the next block. All first floor occupants except one made their ways to the street as smoke, heat and flame spread through open stairways. Noticing that a bookkeeper was apparently trapped in her office on the first floor balcony, her supervisor went back in to get her. Both were trapped and killed.

A salesman and two customers in an automatic elevator when the fire broke out lost their lives when the elevator stopped 30 inches from the first floor level. The advertising manager apparently became aware of the fire too late to escape and was found dead at his desk in his third story office.

Five firemen suffered facial burns trying to enter the building to make rescues, and an 18-year-old boy was injured when his car was in collision with a fire engine responding to the fire.

Table No. 4
Injuries to Firemen at Fires*

Location of Injury	Fall	Fall From Ladder	Cut By Glass	Cut By Axe	Hit By Debris	Hit By Tools	Hit By Hose	Nail Puncture	Burns	Misc. Unk.	Totals
Arm	8	.....	7	.....	3	1	.....	1	3	2	25
Hand	5	.....	42	8	4	1	.....	7	15	20	102
Wrist	6	1	3	.....	1	.....	.....	.....	4	.....	15
Leg	19	2	1	.....	4	1	2	6	.....	6	41
Foot	9	.....	6	3	3	6	1	41	1	4	74
Ankle	10	.....	.....	.....	.....	1	2	.....	1	4	18
Knee	20	1	2	.....	5	1	.....	.....	.....	4	33
Shoulder	8	1	1	1	4	2	1	.....	3	4	25
Back	15	1	2	.....	7*	2	6	1	.....	10	44*
Side	3	.....	.....	.....	.....	1	1	.....	.....	1	6
Chest	.....	.....	.....	.....	2	1	.....	.....	.....	1	4
Groin	6	.....	.....	.....	.....	.....	.....	.....	.....	5	11
Head	2	.....	1	.....	9	.....	1	.....	1	2	16
Face	1	.....	4	1	4	4	5	1	23	2	45
Eye	.....	.....	3	.....	15	1	1	.....	1	3	24
Smoke Inhalation	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	59*
Heart Attack	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
Unknown	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	5
Totals	112	6	72	13	66	22	20	57	52	68	549

*Three injuries were fatal. One fireman suffered fatal back injuries when a wall collapsed. Two firemen died from the effects of smoke inhalation.

Injuries to Firemen at Fires

Casualties to firemen can be logically segregated into two classes: those occurring at fires and those occurring during response to and return from fires. As Table 4 indicates, 549 of the 602 fireman casualties in Chicago in 1952 occurred at fires.

Table 4, prepared directly from the Fire Casualty Report Form, shows the relative frequency of injuries to various parts of the body and the causes of these injuries. Fire department instructors can get many valuable tips from tables such as this, and will be able to use the authority of the record of past experience to strengthen their training programs. In Chicago in 1952, hand injuries were the most frequent casualties and broken glass was the most frequent cause of hand injuries. Information of this type to a fire department instructor may point to the need for more stress on the use of suitable gloves or other hand protection, and improved technique in breaking glass. Foot injuries were second in order of frequency with 74 cases. This figure in itself is not of much practical value but when it is learned that 41 of these cases were nail puncture wounds, the corrective measure immediately becomes obvious, — insistence that firemen use regulation firemen's boots, specially designed to prevent nail punctures. The number of cases of smoke inhalation, firemen cut by axes, injured by other tools or hit by hose, as well as each of the other causes of fireman casualties, are valuable clues that can guide the fire department instructor in his efforts to incorporate effective fire safety training in his instruction.

Needless to say, it would be a dangerous assumption that the experience of any two communities would be alike. Whereas the experience in Chicago suggested more attention to hand and foot protection, high incidence of head injuries in some other city would indicate the need for a greater respect on the part of the fireman for the protective value of

Table No. 5
Injuries to Firemen Responding to Fires*

Nature of Injury	Fall From Apparatus	Vehicle Accident	Improper Pole Sliding	Misc., Unknown	Totals
Arm	2	.....	2	.....	4
Hand	.....	.....	.....	2	2
Leg	5	1	2	1	9
Ankle	4	.....	1	1	6
Knee	4	1	3	.....	8
Shoulder	.....	1	.....	1	2
Back	4	4	.....	1	9
Side	1	.....	.....	.....	1
Miscellaneous	.....	1	2	1	4
Heart Attack	.....	.....	.....	.....	1
Unknown	.....	7	.....	.....	7
Totals	20	15	10	7	53

*No injuries were fatal.

his helmet. The one way to find out the principal causes of fireman casualties in a community, and to measure the effectiveness of corrective steps, is to keep casualty records.

Responding to Fires

When it is considered that the Chicago Fire Department responded to 48,137 alarms in 1952, the 53 casualties suffered by firemen while going to or returning from fires seems relatively small. An analysis of the 53 cases, however, points to several ways in which the record can be further improved.*

Table 5 analyzes the cause of the casualty and the part of the body injured. Contrary to the experience in Table 4, there seems to be no very clear-cut relationship between part of body injured and cause of the casualty that would help pinpoint corrective measures. Consequently, to reduce this class of injury, one must rely almost entirely on a knowledge of frequency of causes. For example, the 20 falls from apparatus, 15 injuries caused by vehicle accidents and 10 injuries caused by improper pole sliding are examples of important statistics that are in the casualty records of every fire department, statistics that should be put to work to improve the fire casualty experience of firemen.

*In addition to the 53 casualties suffered by firemen while responding to fires, five civilians were injured. Four were non-fatally injured in motor vehicle accidents involving fire apparatus. An 84-year-old man stepped into the path of a chief's car and was killed.

Committee on Fire Casualty Statistics

The NFPA Committee on Fire Casualty Statistics was established to study existing data on deaths and injuries from fires and to develop methods and procedures for improving the collection and dissemination of statistics on fire casualties. It was soon discovered that there were very little data available, that there was no universal agreement as to what constituted a fire casualty nor a uniform method of reporting statistics. The Definition of Fire Casualty and the Fire Casualty Report Form were consequently developed by the Committee as necessary first steps in its assigned program to find out how and why people are being injured by fire, and what steps should be taken to avert fire casualties.

The next step, the actual collection of statistics, requires the assistance of fire department officials and others in a position to compile fire casualty statistics at the local level. The collection of such statistics will serve the twofold purpose,

first, of furnishing the types of statistics illustrated in this article as tools to be used by fire officials to improve life safety at the local level, and second, when studied collectively by the Committee on Fire Casualty Statistics will form the basis for intelligent nationwide life safety education.

Many fire department officials have expressed a willingness to collect data on fire casualties in their communities, but additional volunteers are needed. Realizing that the cost and inconvenience of preparing Fire Casualty Report Forms may deter certain departments from offering to compile casualty data, the Committee has arranged to make the Fire Casualty Report Form available without charge. Fire officials and others willing to help in this important undertaking are asked to communicate with the Committee secretary.*

*Chester I. Babcock, Secretary, Committee on Fire Casualty Statistics, c/o National Fire Protection Association, 60 Batterymarch Street, Boston, 10, Massachusetts.

Wide World

Three occupants were killed and twenty-two suffered non fatal injuries in this Boston tenement house fire on June 24, 1953.

An arsonist set the fire in the basement and blocked open the fire door between the basement and rear stairway so that fire could spread vertically. The door from the front hallway to the basement was left open by the person who discovered the fire. Thus, fire, smoke and heat were able to spread rapidly up both interior stairways, trapping occupants in their apartments. Three of them lost their lives, four required hospitalization and 18 suffered minor injuries from smoke inhalation. Four firemen were burned during rescue operations.

The two men who conspired to set the fire were convicted of second degree murder and sentenced to life imprisonment. As far as could be determined, this case is the first in which anyone has been convicted on a murder charge as a result of a fire set to defraud insurance companies.

Water Supplies for Air Raid Emergencies

By George W. Coffin
Consulting Engineer, Coffin & Richardson, Inc., Boston

The Massachusetts Civil Defense Agency created, in May 1952, a Committee on Emergency Water Supplies, headed by George G. Hyland, Commissioner of Public Works of the City of Boston. Shortly thereafter the State of Massachusetts received from the U. S. Federal Civil Defense Administration twenty pump assemblies and 20 miles of 8-inch quick-coupling pipe to be used for civil defense emergency service. The pump assemblies were units of 1,500 U. S. gallons per minute capacity.

Faced with the general problem of emergency water supplies and the immediate one of how best to use the FCDA equipment, the committee decided to follow the course which is usual when an important item of public works is contemplated. The problem was referred to a consulting engineering firm for preliminary study and report. In June 1953 our firm made a report to the Massachusetts Civil Defense Agency on "An Emergency Water System for Fire Service in Boston and Cambridge."

The object of this report was stated in our contract for this investigation as follows:

"a. To determine what quantity of water should be provided, for fire fighting purposes, and at what general locations, in the event of a major conflagration in the Boston area such as might be caused by the explosion of an atomic bomb with a force of the order of 40,000 tons of TNT at optimum height.

"b. To develop a practicable and comprehensive plan for the provision, in such event, of an adequate emergency water supply for fire fighting purposes, including general plans and descriptions of the necessary works, structures or equipment."

Assumptions

A rational approach to the problem was essential and the following basic assumptions were established in developing a wartime emergency water supply for the Boston-Cambridge area:

1. Many small fires may occur over wide areas.

2. Single fires of conflagration or fire storm magnitude may occur which can only be fought from their outer edges.

3. Areas where fires cannot be controlled with the water available will have to be abandoned and efforts made to prevent the spread of the fire to adjacent areas.

4. It will be impracticable to supply the large fire flow demands normally used in peacetime for all fires that may occur.

5. Many parts of existing municipal water systems will be inoperative and water must be obtained elsewhere: from harbors, rivers, lakes and ponds. Water distribution systems consist of numerous service pipes and connections which pass through foundations and walls. In an atomic attack, pressure waves would cause vertical displacement of such walls

Based on a paper prepared by permission of the Massachusetts Civil Defense Agency and presented at the NFPA Regional Conference, Providence, R. I., October 30, 1953.

resulting in failure of those pipes which pass through them. It would not require many such failures to substantially reduce the water pressure and the distribution system could not supply water at the fire hydrants.

6. Many reservoirs must be provided throughout the municipality from which to draw water for direct fire fighting.

7. Reservoirs must be kept full at all times and provisions made for replenishing them during the fire by means of a system of relays through other reservoirs.

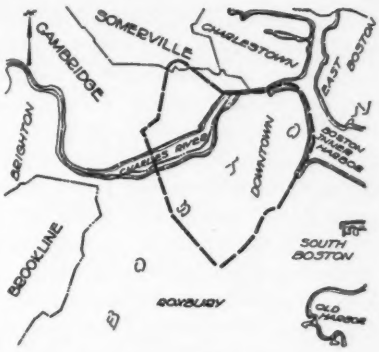
8. For relaying the water from the primary sources, fireboats, land-based mobile pumpers and large quantities of lightweight pipe and hose must be provided and kept at convenient locations where it can be readily moved into or near the area on fire.

9. In a word, any system of emergency water supply must be independent of existing local systems, entirely mobile, and a definite plan prepared in advance for its use when needed. In our Boston study it was assumed that the actual fire fighting would be done by the city fire department and that the relay system for supplying water would be set up and operated by specially trained crews.

Water Supply Demand

Fortunately most of our large metropolitan areas in this country which would be targets for an enemy attack are located on tidewater, large rivers, or lakes. The problem is,—how to get water from these sources in as large volumes as practicable to the many areas that will be on fire.

The determination of the demand rate for wartime fire fighting is the key to the solution of the problem. It became evident that the method of determining the rate of water required for fire fighting in peacetime could not be used to determine the rates required to fight fires resulting from an atomic bomb explosion. It would be impracticable to provide during an incendiary or atomic attack the peacetime demand rate for every block in a city, as such demand rates would require mains and pumps of tremendous size.



DOWNTOWN BOSTON AND VICINITY

The heavy dash line encloses the area of the downtown Boston business district and East Cambridge which was studied in detail.

Due to the lack of quantitative information, it was necessary to make estimates of the quantities required, and then examine them to see whether they were consistent with minimum fire-fighting demands and the maximum practicable rate at which water could be delivered to a fire under disaster conditions. The basic quantities were obtained in terms of an estimated demand for fighting a "manageable" fire in an assumed typical city block.

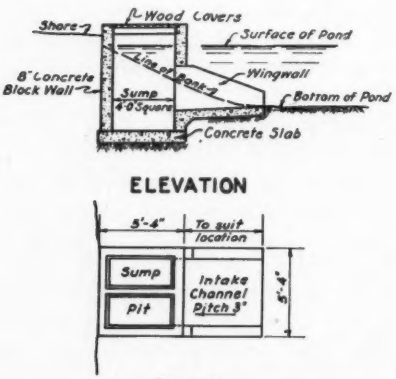
The typical block in our Boston study was taken from an area in the Back Bay bordered by Commonwealth Avenue, Arlington Street, Beacon Street, Massachusetts Avenue and had an area of

120,000 square feet with an average building height of four stories. From our study of the Boston area, it was determined that fire fighting in the typical block (following an aerial attack of sufficient magnitude to render the existing distribution system useless) would not be practicable if fires in this typical block could not be "managed" or controlled with a flow of 600 gallons per minute or less. In arriving at the basic figure of 600 gallons per minute, a careful study was made of both British and German work that had been published on the subject. The comments of British and German fire engineers on wartime fire fighting led us to believe that there will be little, if any, use for large quantities of water. To supply water at the high rates to which our American fire fighters are normally accustomed would require far more men and fire apparatus than one could expect to be available. The water supply, however, should be sufficient to enable a number of small hose lines to be used. This determination was checked against the fact that 600 gallons per minute would provide approximately twelve 1½-inch hose lines.

This is admittedly a judgment factor, but we are pleased to report that it has been tentatively accepted by the committee which ordered the study and will be used until better data is available.

A 600-gallons-per-minute flow is equivalent to 1.25 gallons per minute per 1,000 square feet of floor area one-story high. That is, a block having an area of 20,000 square feet with an average building height of four stories would have a demand rate of 100 gallons per minute (In British Imperial gallons these figures would be respectively: 500 gallons per minute, 1 gallon per minute per 1000 square feet and a demand rate of 80 gallons per minute).

Having established a unit demand rate for a typical block in the city, the entire downtown Boston area was subdivided into blocks or small groups of blocks and individual demand rates for each block were computed in accordance with the above criteria.



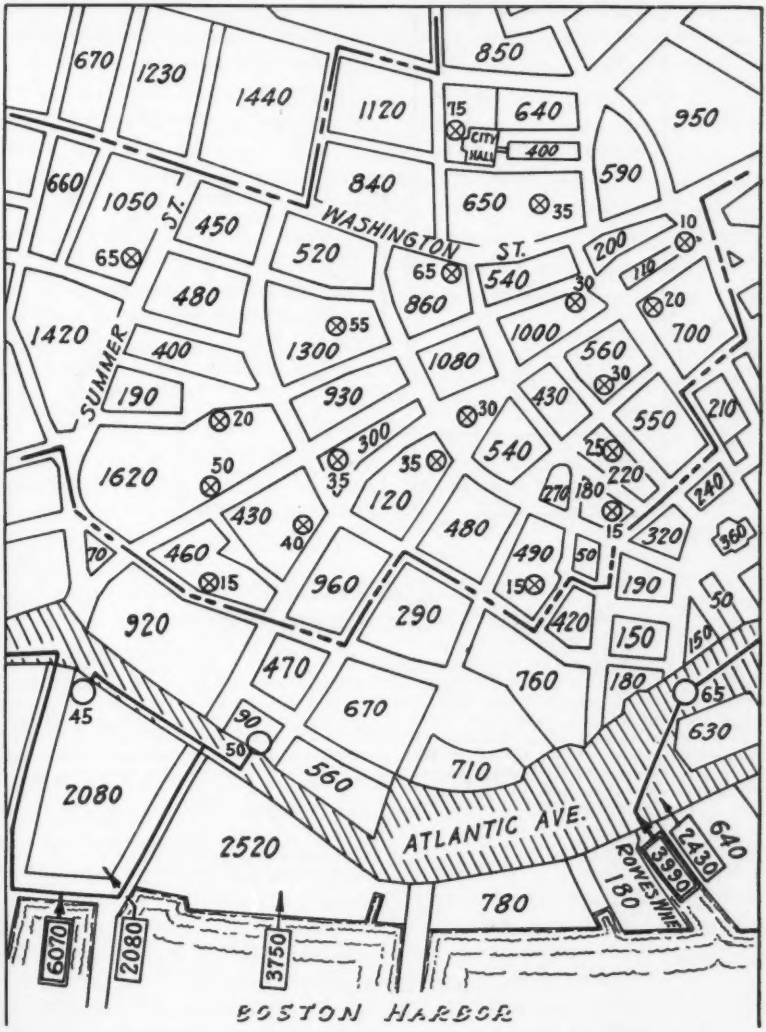
INTAKE SUMP FOR PONDS OR RIVERS

Pump suction facilities in many locations have to be prepared in advance. Sketch shows a suggested design of intake sump for the bank of a pond.

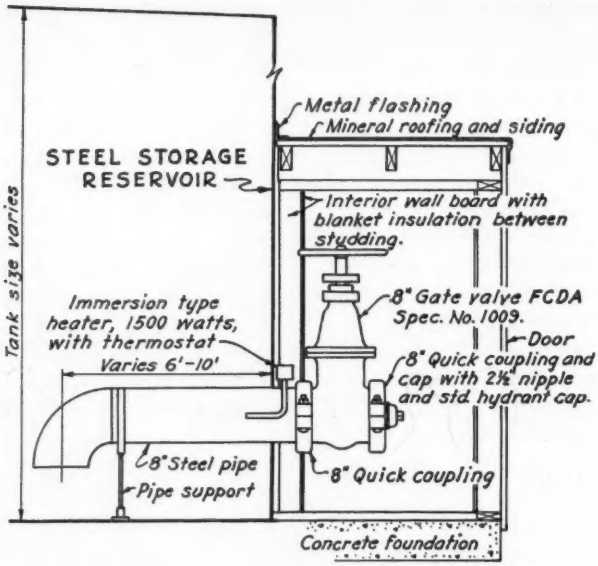
Methods of Fire Fighting

Assuming that fires in a given area have met the requirements previously stated as to manageability, and it has been decided to commit fire fighters and equipment to that area, the following outline sets forth the method of obtaining water for immediate fire fighting:

1. Upon arrival within the area, the regular city water system should be tested to see if any water is available from this source. While our study was based on the concept that the city system would be largely destroyed by the bombing, it

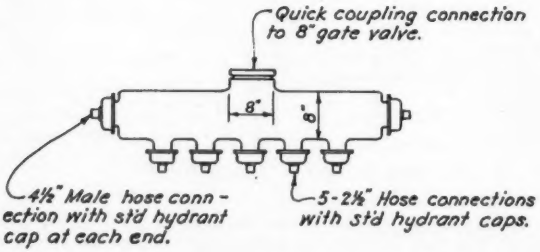


A map of the area to be studied was made and a part of this map illustrated above shows the fire flow demand (in gallons per minute) as computed for each block. The circles show reservoirs (tanks) with an accompanying figure for the storage (in thousands of gallons) to be provided at locations where space is known to be available. Permanent locations for intakes along the harbor are shown by oblongs with figures showing gallons-per-minute pump capacity recommended for each location, including the intakes for two of the perimeter relay systems described more fully in other diagrams. A partly broken heavy line bounds the area served directly by the harbor intakes and the perimeter relays and the area of service from individual storage tanks.


Metal flashing
Mineral roofing and siding
STEEL STORAGE RESERVOIR
Tank size varies
Interior wall board with blanket insulation between studding.
8" Gate valve FCDA Spec. No. 1003.
Door
Immersion type heater, 1500 watts, with thermostat
Varies 6'-10'
8" Quick coupling and cap with 2½" nipple and std. hydrant cap.
8" Steel pipe
Pipe support
8" Quick coupling
Concrete foundation

TANK CONNECTION AND VALVE CHAMBER

For each of the 179 steel street tanks there will be a frost-proof valve house with each connection to the tank valved as shown. Tanks are filled by an additional small connection from the city system and a small drain connection is provided. In cold weather a small amount of water is circulated to prevent tanks from freezing. Only a small quantity of circulating water is necessary to prevent freezing in the Boston area and such a scheme would result in the lowest cost for overcoming the freezing problem. Freezing of the pumper connection is prevented by an electric immersion type heater in the connection.


Quick coupling connection to 8" gate valve.
8"
8"
4½" Male hose connection with std hydrant cap at each end.
5-2½" Hose connections with std hydrant caps.

SPECIAL HEADER FOR MULTIPLE HOSE LINES

Tanks are provided with one or more fire fighting headers depending on the size of the tank and the connections to be made both by fire department pumpers and relay piping.

is obvious that even if it were only partially available, it should be used to its full extent as any water obtained from this source would increase the storage time or the available rate.

2. If the city water supply is not available, the fire-fighting forces should immediately begin operations from the nearest storage reservoir. It is important to note that all utilization of stored water must be by means of fire department or other pumpers of equal capacity and head range, as no pressure other than that due to the height of water in the tank is available.

3. As soon as hose streams have been brought to play on the fires, other crews should begin laying hose lines from pumpers located at any adjacent reservoirs which are not being used for direct fire fighting. If faced with an overwhelming fire situation, the fire fighters can drop back to one of a number of perimeters where there is additional storage.

Storage

It would be impracticable and economically unfeasible to provide storage to supply even the limited demand rates estimated in our report for more than relatively short periods. Storage must be provided for the initial fire fighting period, and a simple and practical method of replenishing this storage will be required.

In determining the amount of storage to be provided, a compromise was made between storage capacity and the rate at which the storage could be replenished from a primary source.

Storage may be classified as perimeter storage, that is storage along natural firebreaks, or isolated area storage. The difference between perimeter storage and isolated area storage in the recommended plan is that perimeter storage would be replenished through an emergency relay system while isolated storage would be replenished from other nearby reservoirs.

In downtown Boston with an area of 1400 acres, 50 perimeter reservoirs in addition to the Public Garden Pond and the Frog Pond on Boston Common were proposed. These reservoirs varied in size from 10,000 to 180,000 gallons and totaled 3,360,000 gallons. The two ponds have a total capacity of 795,000 gallons.

Ninety-six isolated area reservoirs from 10,000 to 85,000 gallons capacity and totaling 3,190,000 gallons were also recommended for this area.

In East Cambridge, ten perimeter reservoirs totaling 180,000 gallons and 19 isolated area reservoirs totaling 415,000 gallons were proposed.

It has been demonstrated in peacetime that efficient fire fighting can be performed if the length of hose between the source and the fire is 500 feet or less, and 750 feet is a practical limit. Therefore, if sources of water were available along all perimeters, efficient fire fighting could be performed in an area having a depth of 500 feet in a direction normal to the perimeter.

Firebreaks or perimeters form a line where an area fire can be stopped from further spreading if sufficient quantities of water can be provided along the length of the perimeter for extended periods of time. The location of the perimeters is a matter of geography and street pattern.

Wherever possible city or state-owned land, playgrounds, parks, traffic islands and similar areas were selected as sites for tanks or reservoirs. Where such locations were not possible, semi-public property, such as institution-owned land or parking lots, was selected.

The capacity of each reservoir is a function of the total demand of the blocks served by the individual reservoir and the specified storage time. Considerable thought was given to the storage period of perimeter reservoirs in an effort to balance the greater protection obtained by a long storage period with the cost of the storage reservoirs. Sixty minutes was finally selected as being suitable. The sixty minutes provides a period between the time when the fire department's apparatus just starts using the stored water and the time when the relay system for the perimeter can be placed in operation.

The question of storage in areas away from perimeters presents an entirely different problem. If such an entire area were on fire, it would be impossible to fight fires from within. The best method of attack in such an event would consist of withdrawing to the adjacent firebreaks and adopting containment-type fighting methods. In such an event, storage within the isolated area would be of no value since it would be impossible to reach and utilize it.

On the other hand, the most common situation would be scattered fires in these areas. Such fires should be extinguished as quickly as possible to prevent them from spreading and uniting to form an area fire. Reservoirs should be provided throughout all areas to cover the demands of scattered fires. After due consideration

(*Continued on Page* 362)

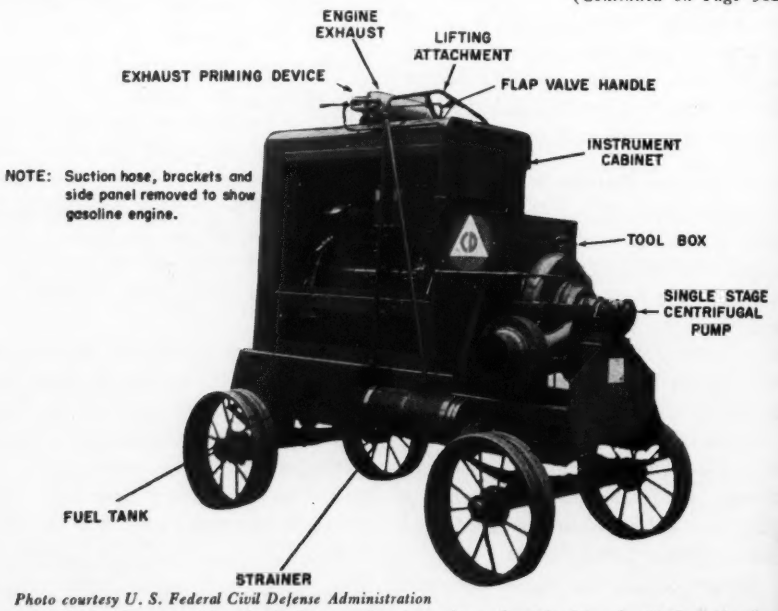
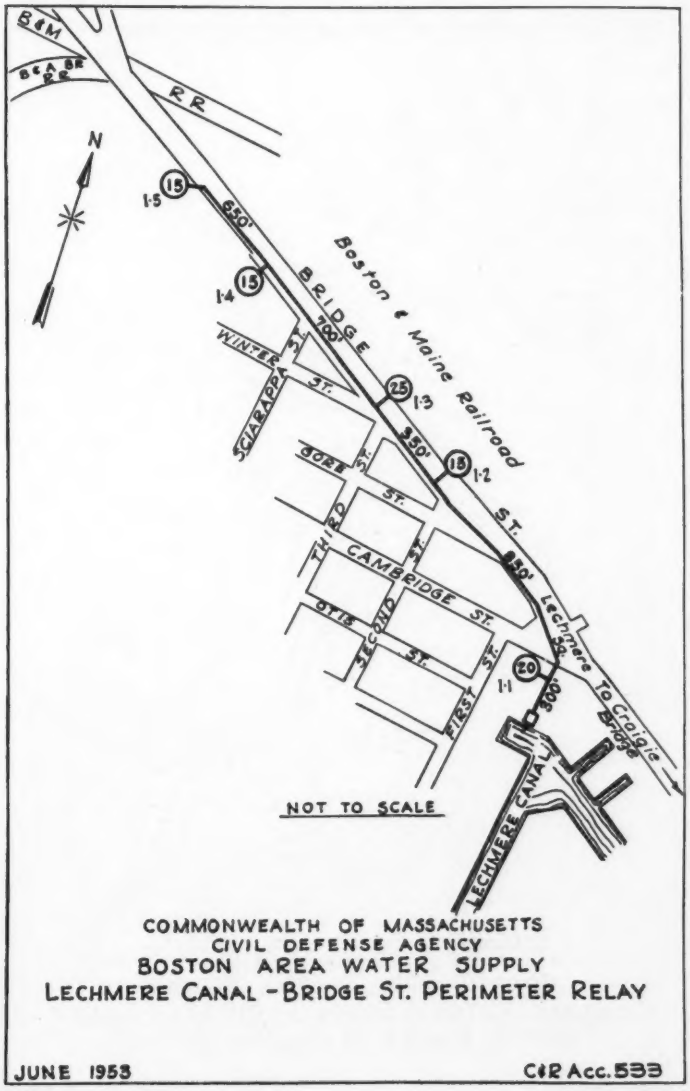
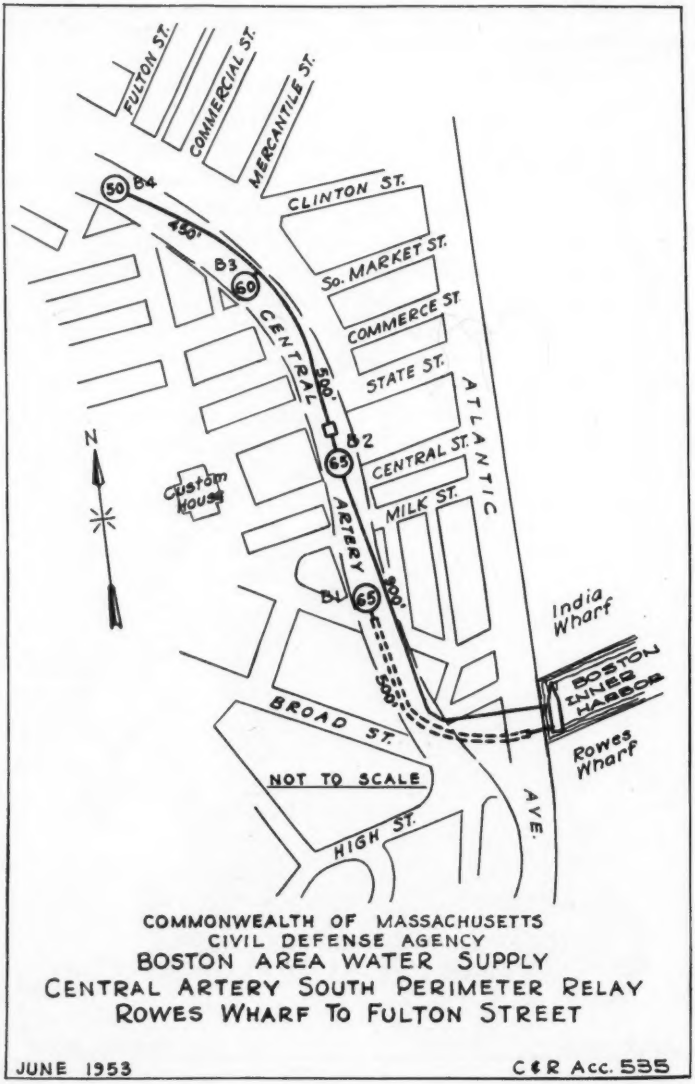


Photo courtesy U. S. Federal Civil Defense Administration

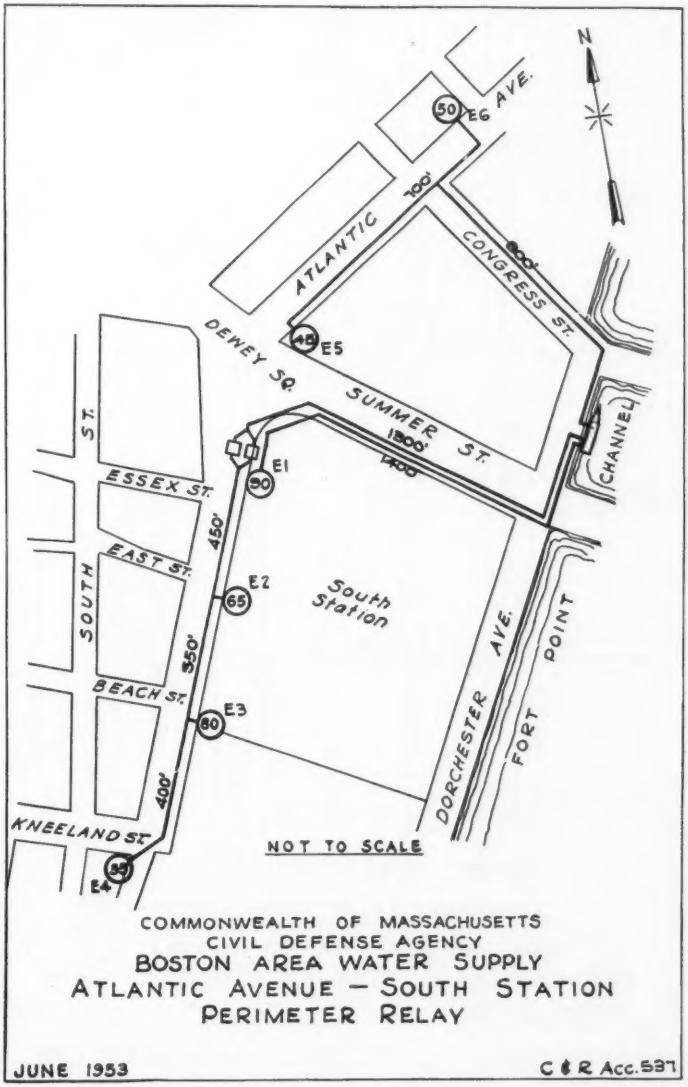
The pump assembly of which a number have been furnished by the U. S. Federal Civil Defense Administration. Pump is gasoline-engine driven, rated capacity 1,500 gallons per minute at 100 pounds per square inch. The pumping relays described were designed with the use of this pump in mind, but the question of whether this unit was the most suitable for the purpose was not covered by this study. The pump assemblies actually used could be different in capacity and other details. The steel wheels and general top-heaviness of this unit are obviously undesirable features.



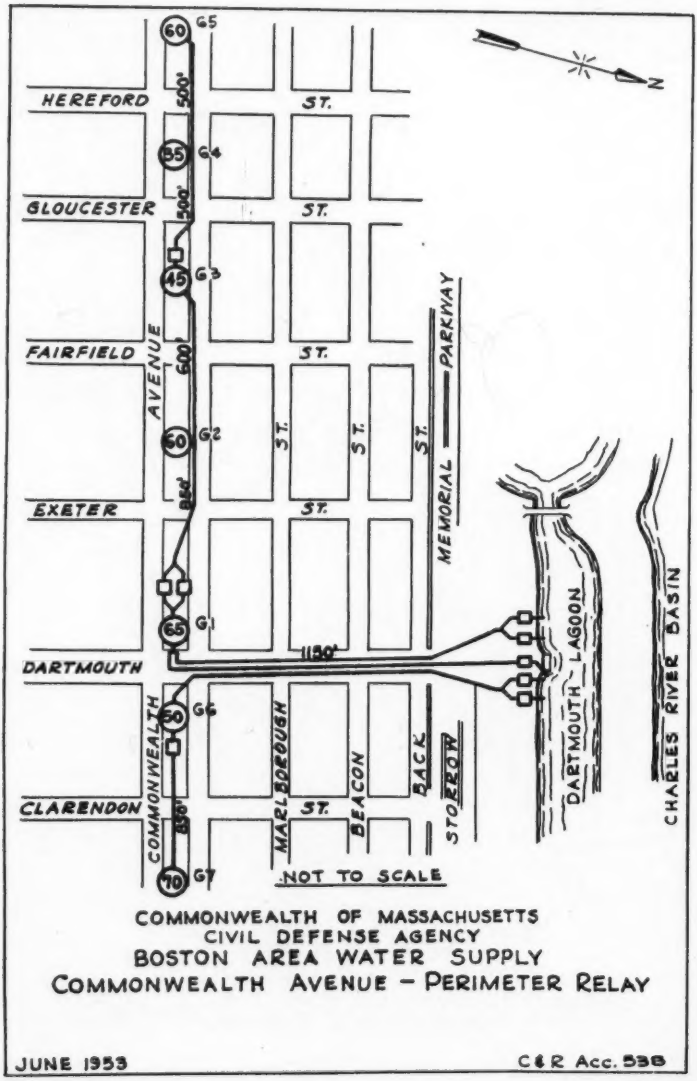
A simple relay, one pump, 1,500 gallons per minute, 8-inch pipe line 2,800 feet long and five reservoirs. Flow into each tank may be separately regulated. In this, and other relays, pipe in streets would be laid in place wherever practical. Figures within the circles representing the tanks are the capacities in thousands of gallons. Figures beside the tanks are the reference numbers for the particular tank.



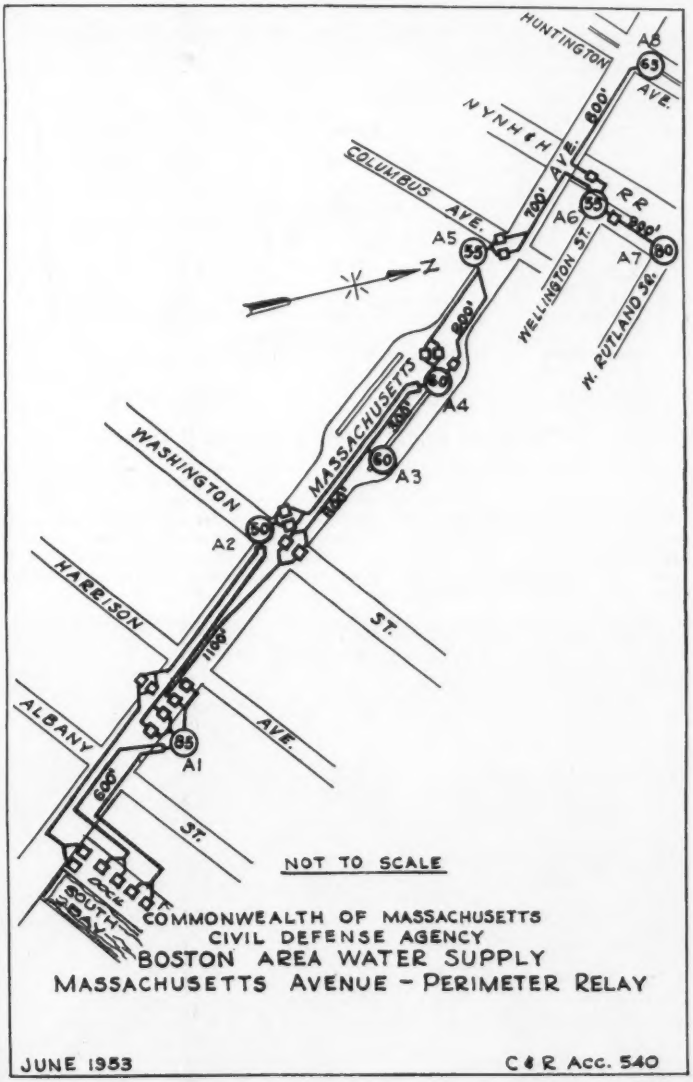
A relay with a fireboat as the primary pumper. Solid line is 8-inch pipe, 1,850 feet. Dotted lines indicate a relay to the first tank produced by two lines of 3½-inch hose of which the Boston Fire Department has a supply. The program includes a few such hose relays to transfer relatively small quantities of water short distances.



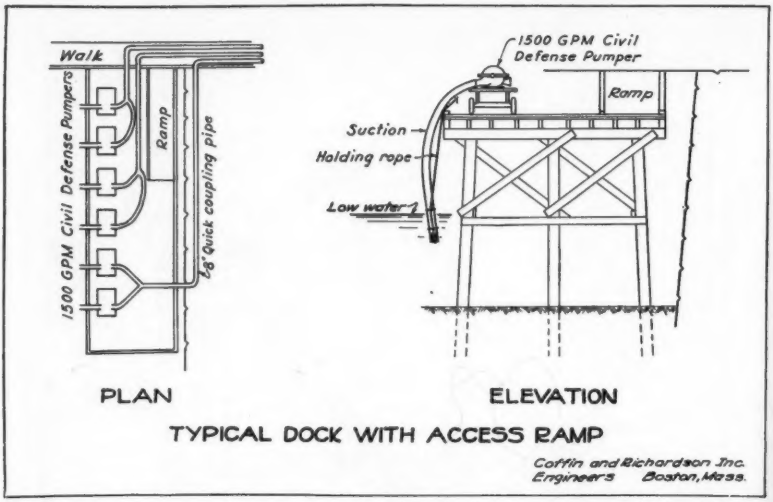
A relay using a total of 5,400 feet of pipe. Fireboat supplies three reservoirs directly, plus a battery of two pumps, 1,500 gallons per minute each, which supply three reservoirs.



In this relay along Commonwealth Avenue there is ample room for tanks on the mall and all pipe could be laid in advance except at street crossings. The small squares indicate a total of nine pumps, each 1,500 gallons per minute. The pumps are, or could be made, portable.



A complex relay with six intake pumps, eight reservoirs and 17 intermediate pumps. The pump units in relays are described as portable but are not readily moved very far except by such means as an automobile truck. To simplify connections, relays are arranged so that not more than two pumps have to be connected to a single 8-inch pipe line. The 8-inch pipe may either by-pass or have a take off to a particular storage tank. In all cases the amount of water to be supplied governs and number of pumps and pipe lines is determined by hydraulic factors. On the expectation that all relays would not be needed simultaneously in all parts of the area, the program calls for providing only half the total number of pumps required by all the relays.



Where land pumps are used at a natural body of water and particularly at tidewater, a dock is often needed to locate pumps within the range of their suction lift. A dock designed for a specific location is illustrated. Essential features are a ramp for automobiles carrying the pumps, pipe connections and flexible connections to movable pumps, both for discharge and suction.

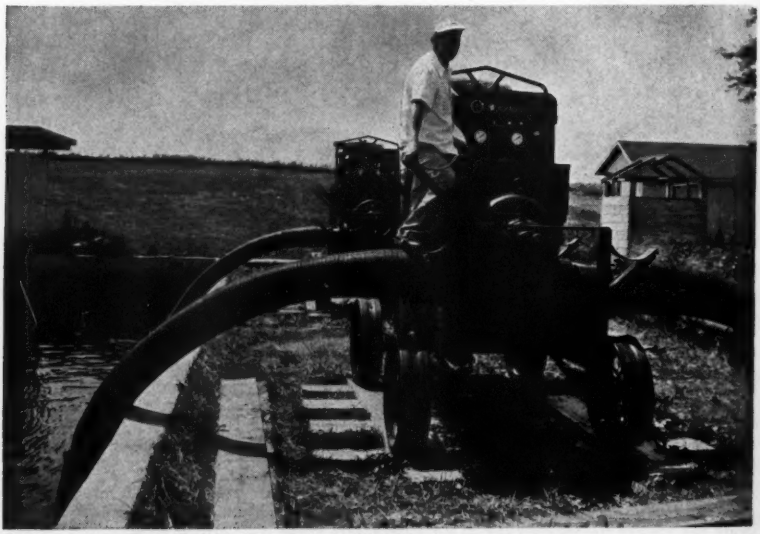
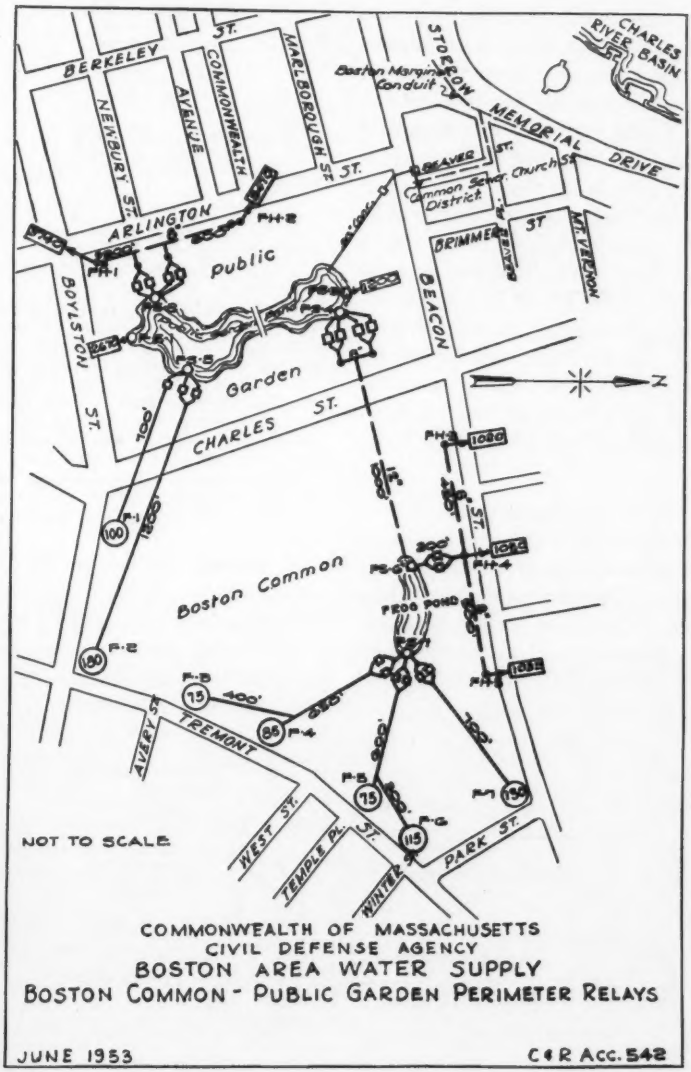


Photo courtesy U. S. Federal Civil Defense Administration

Photo of a demonstration setup of the pump units at the FCDA training center at Olney, Maryland. This shows the flexible suction and discharge hose. Each of the FCDA units has two 10-foot lengths of the 8-inch rubber suction hose shown. The particular pump assemblies illustrated were designed for water utility use and it is to be noted they do not meet fire pump standards.

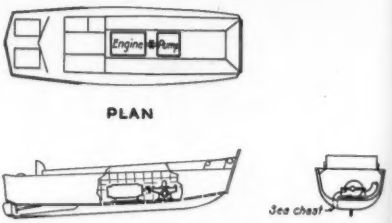


A method of supplying water to a large open area. A special intake supplies 17,000 gallons per minute to the Public Garden Pond from which a relay system with 19 pumps supplies the Frog Pond, 7 reservoirs and 5 hydrants. In Boston, the city Civil Defense Department is installing some experimental intakes but the question of who operates the programmed emergency water system (fire department, water department or a new department) has not been tackled yet.

of all the factors, it was determined that thirty minutes storage time should be provided to cover all demands in isolated areas (the areas away from perimeters). On the assumption that only scattered fires can be fought effectively in any isolated areas, and assuming that sufficient reservoirs are provided in these areas to cover all the block demand rates, there will be numerous reservoirs in each area not in use. If there are fires in one or more blocks of an area served by a single isolated storage reservoir and the adjoining reservoirs are not being used for fighting fires in the blocks which they serve, the available water stored in these reservoirs could be relayed to the reservoir being used.

Reservoir Construction

Both wood stave and steel reservoirs were considered. Steel reservoirs were selected as being the most practical. These reservoirs would be of the low head type with a diameter equal to the height of the tank. Standard fittings were developed for all reservoirs.

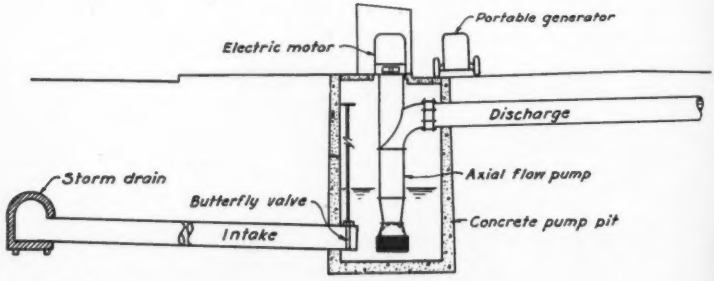


SPECIAL FIREBOAT
AFTER U.S. NAVY
36 FT. LANDING CRAFT LCVP

It is pointed out that for intakes on tidewater, special self-propelled fireboats are desirable. One suggested design is for a small steel boat similar to U. S. Navy's LCVP. Craft is 36.5 feet long, 11-foot beam and has shallow draft. It has speed of 10 to 11 knots. Cockpit and bow ramp would accommodate two of the 1,500-gallons-per-minute CD pumps, but a single 2,500-gallons-per-minute unit is recommended. Multiple fireboat units make it possible to supply any total capacity.

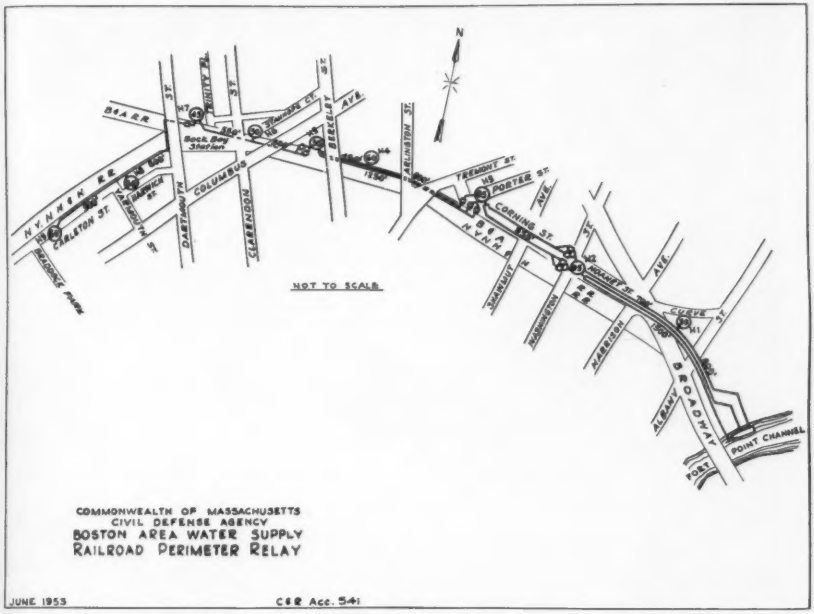
Intakes and Intake Units

Whether to provide numerous permanent intake structures along tidewater or other primary sources of supply with permanent pumping units, or to provide mobile pumpers either of the automobile



PERMANENT PUMP INTAKE FROM LARGE STORM DRAIN

The recommended supply for the Boston Common-Public Garden relay was found to be a storm-sewer conduit providing a practically unlimited water source. It is designed to be made available through a 30-inch concrete underground pipe to a pump intake pit in which an axial flow pump is mounted discharging through a 30-inch pipe to the Public Garden Pond. The arrangements would have adequate bomb resistance.



A complex relay with 9 reservoirs and 10 intermediate relay pumps. The details of the relay are tailored to the section of the city. In this case a railroad right-of-way is a fire-break.

trailer type, or fireboats, is a matter to be determined for each locality. In Boston with a tidal range of 9 feet and a wharf height of about 5 or 6 feet above high water, it was more practicable to provide small fireboats in most cases rather than the land based pumpers.

Cost

Our investigation demonstrated that an emergency water supply system for fire fighting purposes for those portions of Boston and Cambridge studied was both practicable and economically feasible.

The entire emergency water supply system recommended for downtown Boston and Cambridge was estimated to cost $1,410,000, not including cost of Federal Civil Defense Administration equipment, legal expenses or land damages.

This cost is broken down as follows:

Direct intakes, including pumpers and fireboats	$252,000.00
Isolated area reservoirs	584,000.00
Perimeter reservoirs and relay systems	574,000.00
	$1,410,000.00

To put this cost in perspective, it should be noted that the assessed value of that part of Boston and Cambridge studied in our report is about $700,000,000 to which should be added probably another $700,000,000 for public buildings and other non-taxable property and for the contents of the buildings in this area.

Wide World

Mar. 13, 1949. The driver of a butane tractor semi-trailer swerved to avoid hitting a car making a "U" turn in the middle of the Franklin Canyon Highway near Martinez, Calif., with the result that the truck sheared a telephone pole and the trailer overturned. The driver's leg was pinned between the door and the seat which was jammed into the frame. Butane escaped from a broken connection on the tank just behind the cab, but did not ignite immediately. Fortunately Chief Manuel Mello of San Pablo happened to be driving the same route and radioed for help which arrived before the butane ignited. Firemen under the direction of Chief Clarence Viera, County Fire Coordinator, saved the driver's life, protecting him with an asbestos blanket and water fog until a farm tractor pulled the truck tractor from the trailer.

Highway Fires

A Review of Interstate Motor Vehicle Fire Experience

While it is estimated by the U.S. Interstate Commerce Commission* that fire is involved in only about 2 per cent of all interstate motor vehicle accidents, the steady increase in the number of such fire accidents during the past five years and their serious effects warrant special study. The NFPA estimates that there were 194,000 automobile fires of all types in 1952 in the United States with approximately $14,550,000** in losses. This is likewise the highest loss experienced in the last five years.

Comprehensive studies of motor vehicle fire accidents have always been a challenge since fire department and insurance reports are generally not too specific as to cause and the contributing effects of such fires. The NFPA prepared in 1949 a special Motor Vehicle Fire Report form which it distributes in an effort to collect data on specific fire accidents. The volume of the NFPA reports received up to this time has not been sufficient, however, to produce a comprehensive picture of the fire factors, except for tank trucks.† The Interstate Commerce Commission has, fortunately, been collecting data and analyzing results for the past decade and we are reporting herein a summary of their findings as interpreted from their Annual Reports issued on experience from 1947-1951. (1951 is the latest Report published.)

*Motor Carrier Fire Accidents, 1951, Interstate Commerce Commission, Bureau of Motor Carriers, Section of Safety, Washington, D. C.

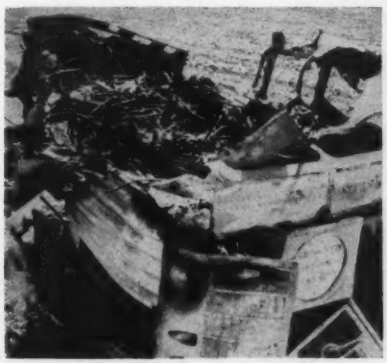
**October 1953 NFPA Quarterly (Vol. 47, No. 2), page 199.

†See October 1951 Quarterly, pages 203-217. Reprinted in NFPA Pamphlet Q45-12, 50 cents each.

Basis of Studies

Only vehicles operated by common and contract motor carriers involved in interstate or foreign commerce are included in the ICC reports. Under the current "Motor Carrier Safety Regulations"* every motor carrier, except private carriers, is required to report to the Commission every accident in which a motor vehicle is involved from which there results "an injury to or death of any person or property damage to any and all vehicles, cargo or other property involved to an apparent extent of

*These regulations are printed in pamphlet form and are available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., Price 20 cents.



Associated Press Wirephoto

Aug. 4, 1952. Two interstate buses collided head-on near the crest of a small hill on U. S. Route No. 81 about 7½ miles from Waco, Texas. Twenty-eight were killed (including both drivers) and 22 injured of the 53 aboard both buses. Fire was instantaneous as fuel tanks, centrally located under passenger seats, were ripped open. One bus was diesel fueled, the other gasoline fueled.

Associated Press Wirephoto

Oct. 23, 1953. This cab over engine tractor semi-trailer was virtually destroyed by a fire which apparently originated from a broken fuel line in the engine. The motor started missing on U. S. Highway 75 outside Council Bluffs, Iowa. The driver started the electric fuel pump but performance did not improve. He stopped, opened the hood and found the entire motor ablaze. A foam extinguisher was used by the driver without success. Flames involved the 100 gallon saddle tanks and spread to the refrigerator motor and to the vehicle tires. A cargo of meat was ruined. Council Bluffs Fire Department personnel knocked down the bulk of fire with booster lines and water fog but magnesium trailer parts and tires were hard to extinguish.

Table No. 1
Motor Vehicle Fire Accidents
Casualties and Property Damages 1947-1951
Reported to the Interstate Commerce Commission

	Fire Accidents	All Accidents
Number of Accidents	2,877	121,077
Number of Fatalities	855	8,075
Number of Injuries	2,471	94,807
Property Damage	$25,223,644	$132,304,952
Fatalities Per 1000 accidents	297	67
Injuries Per 1000 accidents	859	783
Property Damage Per 1000 accidents	$8,767,342	$1,092,740

$100.00 or more." The special studies given to those accidents involving fire by the ICC have been reported in mimeographed form by the Bureau of Motor Carriers, Section of Safety since 1940. Their preparation has been largely the work of Mr. Louis Reznek (now with National Tank Truck Carriers, Inc.), under the supervision of Mr. Ernest G. Cox, Chief of the Section.

In 1951, 669 of the 32,526 accident reports received by the ICC showed that fire was involved. This was a substantial increase over the 591 fire accidents reported for 1950 and was, by far, the highest number since the studies were started in 1940.

In the 1947-1951 period, there were 2,877 fire accidents reported to the ICC, in which 855 persons were killed, 2,471

Associated Press Newsphoto

July 8, 1951. A tractor trailer, out-of-control, ran into a line of parked cars waiting for a traffic light on a hill near Wurtsboro, N. Y. on Route 17. As a result eight vehicles were set afire — three Chryslers, a Cadillac, a Hudson, a Dodge, a Plymouth and the Autocar tractor trailer. Four people were burned to death. Fire control was established by the Wurtsboro Fire Company with booster hose lines fed by two 2½ inch hose lines from a nearby brook.

injured and property damage amounted to $25,223,644. While the number of fire accidents constitute only 2.4 per cent of the total number of all accidents reportable, they caused 10.6 per cent of the total number of fatalities and 19 per cent of the total property damage (see Table No. 1).

Collisions Cause Most Fires

Approximately 54 per cent of all the fire accidents reported to the ICC are the result of a collision with a moving or stationary vehicle, object, person, or animal with the fire occurring subsequent to or as a result of the collison. Another 11 per cent of the fires follow mishaps other than collisions, such as running off the road or overturning (classified as "non-collision" in Table No. 2). Thus, with about two-thirds of all the fire experience resulting from accidents, the greatest potentials for improvement are (1) by avoidance of accidents through better driver training, better working conditions, better vehicles and better roads and (2) by eliminating impact fire hazards. The "fire only" accidents which account for about one-third of the experience may be attacked directly on the basis of fire causes and the principal problems in this category are tire fires, fires in cargo and defective vehicle electrical systems.

Table No. 2

Fire Accidents by Types, 1947-1951 Interstate Commerce Vehicles

	No. of Accidents	Percent of Total No.
Collision	1,553	54%
Non-Collision	319	11%
Fire Only	1,005	35%
Total	2,877	100%

Acme

Nov. 15, 1951. The fire which badly damaged the Autocar tractor semi-trailer being towed out of the Holland Tunnel was caused by heated gases from a broken muffler overflowing the gasoline in a 40 gallon full fuel tank. The gasoline was ignited either from the muffler, located only four inches from the tank, or by a spark. Port of New York Authority personnel used foam and carbon dioxide extinguishers to control the fire and completed extinguishment with foam from a pick-up nozzle on hose lines taken from the tunnel fire mains.

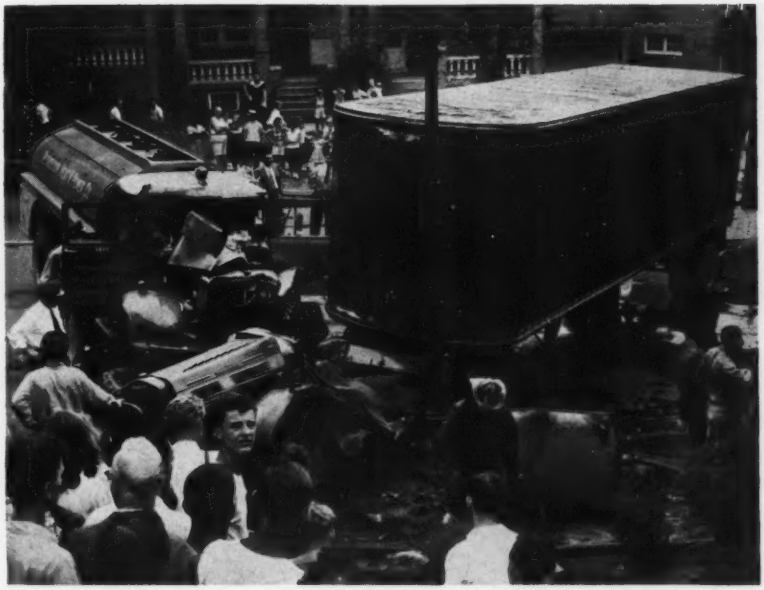
Table No. 3
Persons Killed or Injured by Type of Carrier
Five Year Study of Interstate Commerce Commission Reports

Year	Passenger-Carriers		Property-Carriers	
	Fatalities	Injuries	Fatalities	Injuries
1951	9	112	186	473
1950	9	58	186	414
1949	25	111	145	349
1948	23	207	154	314
1947	7	138	111	295
Total	73	626	782	1,845

Fatality Rates

Table No. 3 distributes the fatalities between passenger and property carriers and it will be noted that over 10 times as many fire fatalities occur on the property-carriers as happen on buses. The record in 1949 and 1948 on buses was influenced greatly by two tragic accidents which caused 30 of the 48 fatalities.

The bus fire accident ratio to all accidents is substantially better than the cargo carriers. In 1951, for example, only one interstate bus accident out of 190 involved a fire while, in the same year, 1 out of every 43 property-carrying accidents involved a fire; the latter is 4.4 times the rate for buses. (NOTE: this experience applies only to interstate and foreign commerce where losses exceed $100 per accident; a greater fire frequency



United Press Photo

Aug. 6, 1952. The petroleum tank truck shown apparently failed to stop at a "Stop" sign while crossing 5th St., N.W. in Washington, D. C. and collided with the tractor trailer. The impact was directly on the saddle tank of the tractor and gasoline was spilled on the battery cable which was sparking due to impact-inspired short circuit. The gasoline ignited instantly. The driver of the tractor trailer was unable to escape and was burned to death. The NFPA report noted that the 100 gallon saddle tank was located adjacent to the battery box.

rate would be expected if local operations and losses under $100 were included.)

Most bus fire fatalities were in collision accidents while over 80 per cent of the fatalities in property-carriers also resulted from collisions. Fatalities in "fire only" accidents are almost negligible.

The statistics also show that bus drivers are much less likely to be injured in fire accidents than are truck or tractor drivers. Bus drivers in 1951 were injured in only 1 out of 8 fire accidents whereas truck and tractor drivers were injured in 1 out of every 2.4 accidents. The ICC comments that "it is probably true that the different position of the fuel tanks and engines in buses, as compared with trucks and tractors, influenced this difference."

This comment carries a forceful impact in the light of the experience in 1951 property-carriers which shows that almost one-half of the drivers killed in fire accidents were burned to death in their cabs, emphasizing the need for improved fuel tanks and better tank location.

Fuel spillage is a prime consideration in the fire fatality picture. From what is known, even passenger cars have a safer fuel system (the source of almost all fires in collisions) insofar as protecting the occupants of the vehicle is concerned following collisions.

Tractor Semi-Trailers Worst

Tractor semi-trailers were involved in about 68 per cent of all the accidents reported (including those not resulting

LeRoy Anderson, Kenosha News

Mar. 24, 1953. This tractor trailer gasoline tank truck was struck on the rear by a semi-trailer while travelling down a highway near Somers, Wisc. about 4:30 a.m. The collision resulted when the driver of the semi-trailer "sneezed and blacked out" and could not avoid hitting the tanker. The tank truck was almost a total loss burning for about two hours but no explosion occurred.

Table No. 4
Motor Vehicle Fires by Type of Vehicle
Interstate Commerce Commission Five Year Record 1947-1951

Type of Vehicle	No. of Fire Accidents	No. of Fire Fatalities	No. of Injuries	Total Property Damage	Approximate Damage Per Accident
Buses	167	73	572	$831,138	$5,000
Trucks	102	8	38	352,769	3,460
Truck Full-Trailer	90	28	40	718,784	7,990
Tractors Only	43	8	28	360,210*	8,400
Tractor Semi-trailer	2,320	657	1,494	20,137,254	8,680
Tractor Semi-trailer-Full trailer	69	53†	97	678,420	9,800
Others or Mixed	50	19	191	2,060,259**	41,200
Drive-away Combination	36	9	11	84,810	2,360
Total	**2,877**	**855**	**2,471**	**$25,223,644**	**$8,771**

*Includes one case where property damage totalled $253,500 following destruction of a garage caused by a fuel line failure on a tractor.

**Includes two terminal fires; one caused $43,400 damage with total loss to 2 tractor semi-trailers, 5 tractors and 3 trucks and one caused $285,800 damage with total loss of 18 trucks, 3 tractors and 5 semi-trailers.

†36 of the 53 fatalities occurred in one accident involving a gasoline tank motor vehicle and a street car (See NFPA No. N393-1 or June 1950 Fire News).

United Press Photo

Jan. 28, 1953. A 4,800 gallon gasoline tank truck skidded while attempting a turn on icy Route 5 and struck a 12 inch iron traffic signal pole in Little Falls, New York. The pole impact apparently ruptured the cargo tank of the semi-trailer which tipped over about 100 feet beyond the pole. Leaking gasoline ignited and an explosion followed according to Chief Abram Swartz of the Little Falls Fire Department which ripped the bulkheads between the 3rd, 4th and 5th compartments. Seven homes and five garages were damaged by the ensuing fire.

in fire). The high vulnerability of these vehicles to fire damage appears self-evident when it is noted that 80 per cent of the fire accidents involved tractor semi-trailers (see Table No. 4). To illustrate by contrast, buses were involved in about 16 per cent of all accidents but appear in only about 5.8 per cent of the fire accidents.

While the average property damage loss for all accidents reported to the ICC during the five year period was $1,092, this average climbs significantly to $8,771 for those cases involving fire (see Table No. 4). It might be viewed, therefore, that fire accidents are eight times more damaging than the average accident and costly design improvements might well be justified dollar-wise by such knowledge.

Collision Experience Varies

About 54 per cent of the fire accidents, as shown in Table No. 2, are the result of collision. Table No. 5 shows the distribution of the 1,553 fire accidents on the basis of the "object collided with." It shows that private cars are the most frequent other object involved in collision but perhaps more significant is the contrast between passenger and property carriers as regard collision with fixed objects and locomotives. Since collisions with fixed objects are usually indicative of total loss of control, the 12 per cent greater frequency in the property-carrier category is significant, as are the 52 cases of property-carrier collision with locomotives as opposed to no similar incidents with buses.

S. J. Melinagagio, Omaha Evening World-Herald

Oct. 9, 1953. An interstate ammunition carrier smashed into the rear of a 1951 Ford Sedan while both cars were travelling east on a busy highway 10 miles outside Omaha city limits near Boys Town. The fuel tank of the Ford was ruptured at impact and flames quickly engulfed both vehicles. Three of the four occupants of the Ford were killed as a result of the ensuing fire. The tractor semi-trailer was loaded with 105 millimeter shells with powder bags and the seven powder bags per shell exploded from the intense heat of the ensuing fire. The 100 gallon saddle tank on the trailer contained about 30 gallons at the time of the accident and all the fuel was consumed in the ensuing fire.

Table No. 5
Types of Vehicles and Objects Involved in Collision Accidents

Interstate Commerce Commission Five Year Study 1947-1951

Vehicle or Object Collided With	Type of Motor Carrier: Passenger-Carrier No.	Passenger-Carrier Percent	Property-Carrier No.	Property-Carrier Percent	Total No.	Total Percent
Private Car	43	57	536	36	579	37
Fixed Object	10	13	374	25	384	25
Combination	8	10	310	21	318	20
Truck	12	16	168	11½	180	12
Locomotive	0	0	52	3½	52	3
Bus	1	1	12	1	13	1
Street Car	0	0	6	½	6	.....
Miscellaneous	2	3	19	1½	21	2
Total	**76**	**100**	**1477**	**100**	**1553**	**100**

Acme Photo

Nov. 7, 1951. Most interstate carrier collision fire accidents involve passenger cars. This interstate bus was in collision with a 1950 Studebaker on Route 101 outside Dana Point, Calif. near a lighted intersection about 5:55 P.M. All 37 occupants of the bus escaped without serious injury, but the driver of the other car was burned to death in the vehicle.

Cargo Studies

Studies directed at the 2,877 fire accidents during the five year period 1947-1951 as to type of lading does not show a great deal other than to indicate that all types of carriers are subject to adverse fire experience on the highway.

General merchandise trucks were involved in 32 per cent of the accidents, but this is to be expected since such cargoes predominate. Unfortunately, no comparable distribution of motor carrier operations by type of cargo on a vehicle-mile basis is available so that no comparison on a mileage basis can be made as to the influence of various types of cargoes on causing or contributing to fires.

In the 1951 report, the ICC analyzed both the fatality rate and average damage per accident by type of lading for the first time. The results were revealing in certain respects despite the relatively small number of accidents recorded. The highest number of fatalities occurred in the "no cargo" class and the ICC notes that this may be tied in with excessive speed under "no load" conditions. In the 1951 record, where over 10 accidents were listed in a commodity class, the highest fatality rates were, in order, "no cargo," gasoline transports, other petroleum transports, sheet steel and casting haulage, food and beverage trucks, motor vehicle transports, building materials truckers.

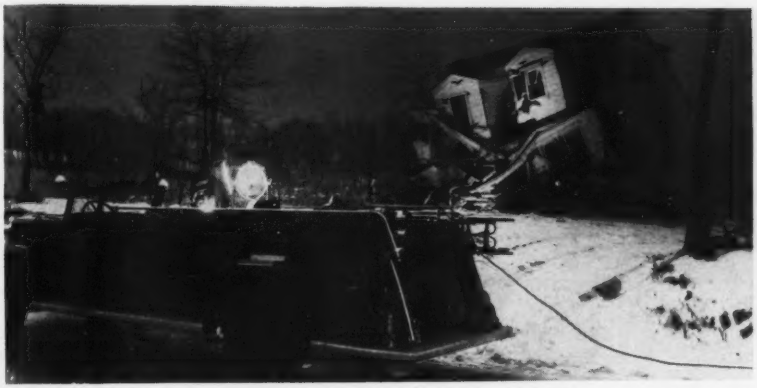
The highest average property damage per accident hits the explosives and

Associated Press Wirephoto

July 23, 1951. While travelling north on Penna. State Route 100, the driver of this propane powered 4,000 gallon propane tractor semi-trailer heard the safety valve operate on the saddle tank on the right side of the tractor. Fire came in the cab window as the driver halted the vehicle. He extinguished the fire with a foam extinguisher and then was taken to the hospital by a passing motorist. Fire broke out again after the driver left. Heat exposure on the trailer caused the tank safety valves to operate and the State Police advises: "If it were not for the safety valves on the trailer it is certain that the trailer tank would have exploded causing much more damage and possibly a large number of injuries or death to the firemen."

Table No. 6
Place of Fire Origin on Motor Vehicles
Property and Passenger Vehicles in Interstate Commerce
Five Year Record 1947-1951

Place of Fire Origin	No. of Cases	Percentage
Fuel Tanks (largely due to collision damage and rupture)	997	35.0
Under Hood and About Engine	520	18.0
In Dry Cargo Space	245	8.5
At or Near Tires	187	6.5
In Vehicle Wiring (except under hood and about engine)	151	5.5
In, Under or About Cab (otherwise unspecified)	134	4.5
At Fuel Lines (except under hood and about engine)	100	3.5
In Liquid Cargo Space	75	2.5
At or Near Brakes	40	1.5
On Vehicle Roof or Tarpaulin	32	1.1
In Passenger Space	7	0.2
Off Vehicle, Spread to Vehicle	181	6.2
Miscellaneous, Unknown and Not Reported	208	7.0
Total	**2,877**	**100.0**



Citizens Fire Co.

Feb. 1, 1951. An explosion of a dynamite laden tractor trailer on U. S. Route 340 near Halltown, West Virginia wrecked this dwelling, caused one death and critically injured two others living in dwellings within 500 feet of the explosion site. The driver of the truck discovered a fire at the fuel tank while the truck was in motion and theorized that the blaze was caused by a puncture of the tank by a broken tire chain. He ran to warn occupants of nearby houses at 4:40 A.M. but could not complete his self-imposed assignment before the blast in 15 tons of dynamite aboard the truck occurred.

ammunition carriers followed by gasoline transports, tobacco carriers, liquor haulers and textile carriers. The range was from about $30,000 per accident down to about $2,500 for the lowest average. There are a number of factors which influence this, namely, the value of the commodity being transported, the dangerous nature of the cargo under fire conditions, and the type of vehicle being used to transport the product. In connection with the latter, food carriers had an average loss of $7,857 per accident in 1951, well above the average loss of all accidents analyzed during that year and this may be due in large part to the high value of refrigerated vehicles commonly used in transporting perishable commodities.

Place of Fire Origins

Danger spots in motor vehicles are indicated clearly in Table No. 6 showing the place of fire origin in the 2,877 fire accidents reported to the ICC during a five year period. Fuel tanks are the reported origin of 35 per cent of these accidents with engine compartments, dry cargo spaces and tires second, third and fourth on the list. In the 1951 ICC report, it is shown that in bus accidents only 1 out of 14 fires start at the fuel tank while on property-carriers the fuel tank origin is on a ratio of about 1 out of every 3. The tire fire problem is similar. In 1951, three tire fire accidents occurred on buses; only one previous fire, occurring in 1949, was of such origin on a passenger-carrier. In other words, 183 of the 187 tire fires occurred on property-carriers.

Table No. 6. should serve as a guide to designers and operators to avoid future fire accidents. Stronger and better protected fuel tanks and fuel lines appear necessary. Better wiring design, improved methods of cargo loading and more attention to proper inspection and maintenance programs for tires are indicated as methods to control fire.

Fire Causes

Fire causes are detailed in Table No. 7. The very first line of this Table shows the biggest single factor — collisions. What happens to produce fires following collisions is given in the list of actual number of cases reported. Mechanical defects caused 674 of the 2,877 fires and the specific sources are singled out as a guide to prevention activities. Nonmechanical fire causes are comparatively few and cigarette ignitions seem surprising low but the facts reported are, to this degree, reassuring.

Not included in the Table but significant are the following comparisons between the two types of carriers.

(1). In collision accidents, 34 per cent of the property-carrier fires were caused by broken or smashed fuel tanks

(*Continued on Page* 379)

Table No. 7

Motor Vehicle Fire Causes

Property and Passenger Carriers in Interstate Commerce

Five Year Record 1947-1951

	No. of Fires	Total No. of Fires
Collision Fire Accidents		1860
Broken or Smashed Fuel Tank on Vehicle (s)	853	
Spillage of Fuel or Flammable Liquid on Hot Parts	258	
Sparks from Short Circuit in Electrical System	131	
Broken Fuel Cargo Tank on Vehicle	50	
Contact of Vehicle with Power Lines	47	
Off-Vehicle-Spread to Vehicle	132	
Miscellaneous, Undetermined or Not Reported	389	
Mechanical Causes for Vehicle Fires		674
Hot Tire	179	
Bad Electrical Wiring (Lights, Ignition, etc.)	143	
Tanks or Flammable Liquid Lines Leaking	87	
Backfire at Carburetor	41	
Hot or Leaky Exhaust System	39	
Carburetor or Fuel Pump Leak on Engine	33	
Fuel Tank Ruptured or Fell Off Vehicle	31	
Hot Parking Brake	27	
Defective Cargo Heater or Installation	22	
Hot Service Brake	18	
Backfire at Exhaust	15	
Defective Refrigerator Unit or Installation	6	
Miscellaneous Mechanical Causes	33	
Non-Mechanical Fire Causes		153
Cigarettes in or Around Vehicles	39	
Shorted Cargo of Batteries	10	
Welding on Vehicle	5	
Power Line Fell on Vehicle	3	
Other Fire—Spread to Vehicle	49	
Miscellaneous Non-Mechanical Causes	47	
Cause Unknown or Not Reported		190
Total		2877

Associated Press Wirephoto

Sept. 17, 1953. A load of phosphorous grenades ignited while a truck operated under ICC license was traveling on State Route 431 in Marion County, Indiana. The driver detected the fire, stopped the truck and was able to escape before an explosion occurred which wrecked the vehicle. The Indianapolis Fire Department responded to a telephone alarm received about 10 minutes after the fire was detected and travelled 3 miles to the accident site. Fire control was established in the wreckage with hose lines.

Table No. 8
Fire Extinguishers for Motor Vehicles

Types of Extinguishers (Listed Alphabetically)	Old ICC Requirement Before Dec. 31, 1952	New ICC Requirement After Dec. 31, 1952	NFPA Recommendations (NFPA No. 512, June 1952)
Carbon Dioxide	2 lbs.	4 lbs.	1—15 lbs. or larger or 2—5 lbs. or larger
Carbon Tetrachloride	1 qt.	1½ qts.	1—2 qt. or larger or 2—1 qt. or larger
Dry Chemical	2 lbs.	4 lbs.	1—10 lbs. or larger or 2—4 lbs. or larger

Notes on Table No. 8

1. ICC regulations state that fire extinguishers must qualify under Classification B of the standards of Underwriters' Laboratories Inc. in effect on June 30, 1951.

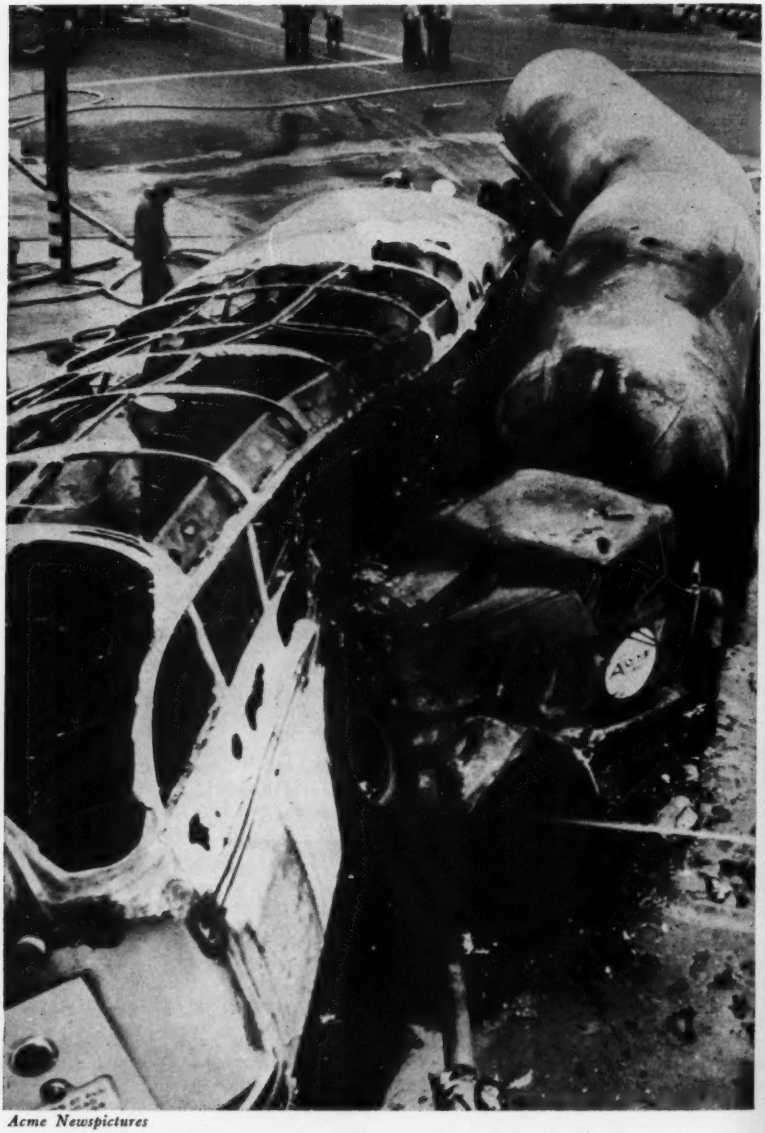
2. ICC regulations specify the three types indicated above and then state: "or extinguishers of other types having extinguishing capacity equivalent to any of these types."

3. ICC regulations authorize that two extinguishers may be carried to obtain the capacity required subsequent to December 31, 1952.

4. The NFPA recommendations given above apply to trucks (not buses) for cargo other than bulk flammable liquids, gases and other dangerous tank cargoes. For buses, see NFPA Standard No. 83 (Transit Operations). For flammable liquid tank vehicles, see NFPA Standard No. 385.

5. The NFPA recommendations state that when a choice is to be made between providing one of the larger units or two of the smaller units, it is preferable to provide the single larger unit.

6. The NFPA recommendations use the term "vaporizing liquid" extinguishers instead of restricting the recommendation to "carbon tetrachloride," as is done in the ICC regulations. Chlorobromomethane extinguishers of approved types would thus be authorized under the NFPA recommendations but are subject to interpretation under the ICC rules.



Acme Newspictures

June 14, 1951. Following collision of this 7,000 gallon capacity isobutane transport truck with an empty school bus in San Fernando, Calif., spilled gasoline from the bus fuel tank ignited. A severe fire resulted, burning tires and causing two diesel fuel tanks on the LP gas truck to explode. Relief valves on the LP gas cargo tanks operated under the heat exposure and flames leaped 60 ft. in the air. Firemen successfully controlled the fire, neither cargo tank exploded and when the exposure fires were out, the burning butane at the vents was self extinguished.

as opposed to only 11 per cent from such origins on buses. It can be concluded that the fuel tanks in buses are less exposed to collision damage.

(2). Collision or overturn were responsible for 46 per cent of the passenger-carrier accidents and 66 per cent of the property-carriers; conversely, 44 per cent of the bus fires started from mechanical fire causes as opposed to a 22 per cent experience with trucks. Perhaps the location of bus engines and the strain placed on buses in city traffic are the reasons for delayed detection and increased frequency respectively for leaking fuel lines, defective carburetors and fuel pumps, bad electrical wiring, overheated brakes (largely parking brakes) and defective exhausts, which factors are responsible for 90 per cent of the known mechanical bus fire causes.

Acme Photo

Sept. 6, 1951. Bus engine fires are usually well advanced when discovered especially when they occur while the vehicle is in motion. This shows a typical such fire involving a Triboro Coach Co. vehicle in New York City. Note the ineffective exterior use of extinguishers.

Fuel Spillage Factors

In their 1951 report the ICC analyzed the influence of fuel spillage on fire behavior and casualties. They showed that fatalities resulted in a ratio of 8.3 to 1 when comparing accidents involving fuel spillage as opposed to those where no spillage occurred. Fatality rates were 0.539 per accident where fuel spillage resulted and 0.113 for non-fuel spillage accidents. They comment as follows on this subject:

"No matter how the data is examined, the only final conclusion which can result is that fuel spillage is to be avoided by all practical means. Practical means include better and stronger fuel tanks, improved protection and location, and consideration of more extensive use of less flammable fuels."

"Safety tank" experience as opposed to experience with vehicles not so equipped cannot be satisfactorily analyzed from the ICC fire accident reports. The main reasons for this are (a). the variety of exposure conditions (the exposed location of safety tanks vs. the relatively protected location of the usual non-safety tank) and (b) the fire experience cannot show the fires prevented by fuel tanks remaining intact in an accident. The increasing use of safety type tanks is encouraging and might well influence future motor vehicle fire experience.

Other Facts

The ICC studies also reveal the following facts. Hundreds of accident reports indicate the value of fire extinguishers aboard motor vehicles. This is why the Motor Carrier Safety Regulations require fire extinguishers as part of the emergency equipment which must be carried on all interstate and foreign passenger and property-carriers. The 1947-1951 motor vehicle fire accident record has indicated, however, that somewhat larger extinguishers would be of value and, as a result, the Commission's recently revised safety regulations have required that after December 31, 1952 larger capacity extinguishers be supplied. Table No. 8 sets forth the old ICC rules, the current require-

ments, and, for comparison purposes, the recommendations of the NFPA Committee on Truck Transportation.*

Neither the ICC nor NFPA expect that hand extinguishers of the sizes indicated will control a major motor vehicle fire but the larger sizes of "first-aid" appliances should improve the opportunity for controlling incipient fires.

Tire fire extinguishment poses a special problem and the ICC notes that no extinguisher presently specified has proven of practical value in such situations. They emphasize the importance of fire prevention as the only remedy for tire fires. (See NFPA Pamphlet No. 512, Section B-130.) In their 1951 analysis, the ICC notes that six fires and explosions reported since 1950 involving the transportation of explosives resulted from tire fires. The Munitions Carriers Conference of the American Trucking Associations, the NFPA Committee on Truck Transportation and other interested agencies are currently further investigating the tire fire problem.†

On a vehicle-mileage basis, passenger-carriers reporting to the ICC operated about 870,000,000 miles in 1950 while property carriers operated about 5,165,000,000 miles in the same year (latest available statistics). The fire accident rate per million miles for buses in that year was 0.029 and for property carriers 0.124. The latter rate is 4.3 times the former and is roughly comparable to those for preceding years.

Summary

1. Interstate motor vehicle fire accidents cause about 10 per cent of all interstate motor vehicle fatalities while occurring in only 2.4 per cent of those accidents.

2. Interstate motor vehicle fire accidents cause about 19 per cent of all interstate motor vehicle property damages while occurring in only 2.4 per cent of those accidents.

3. Two-thirds of all interstate motor vehicle fire accidents follow collisions, overturn or running off the road. The remaining one-third are "fire only" accidents.

4. Better driver training, better working conditions, better vehicles and better roads are major approaches to reduce motor vehicle accidents of all types. Vehicle design improvements to eliminate impact and mechanical fire causes represent the most fruitful means to reduce motor vehicle fire accidents.

5. Since the driver fatality rate on property-carriers is four times that of passenger-carriers in fire accidents, and since the positions of fuel tanks and engines are the major factors for the difference, it appears desirable to concentrate design improvements on these two items in trucks.

6. With tractor semi-trailers having the worst fire accident experience, particular study should be directed to this type of vehicle.

7. The expense of accident and fire prevention programs in the motor vehicle field appears amply justified by the fact that fire accidents are eight times more damaging on the average than non-fire accidents.

8. Driver training by bus operators appears to be paying handsome dividends in avoidance of "lack of control" and railway crossing accidents which property-carrier management might well note.

9. All types of motor vehicle operators need be concerned with the motor vehicle fire accident problem. General

*See NFPA Pamphlet 512, Paragraph B-111. Copies of the Pamphlet are available from NFPA Publications Service Department for 25 cents each.

†Recent developments will be reported at the NFPA Annual Meeting, May 17-21, 1954, Hotel Statler, Washington, D. C.

cargo haulers are at least as subject as the hazardous cargo operator. Of course, the latter is subject to higher average loss and greater public apprehension following a tragedy but type of lading is rarely the sole criteria for determining fire prevention needs.

10. Fuel tanks, engine compartments, dry cargo spaces, tires and vehicle wiring are the principal sources of motor vehicle fires indicating to designers and operators the regions for most fruitful attack.

11. Smashed or ruptured fuel tanks may be singled out as the most critical item since the fatality ratio in accidents involving fuel spillage is eight times that where no spillage occurs.

12. Increased use of "safety tanks" is indicated.

13. Fire extinguishers of larger size than the conventional one-quart vaporizing liquid or two-pound carbon dioxide are indicated by experience in the motor-vehicle fire accident experience recorded by the Interstate Commerce Commission.

14. Tire fires are receiving important new attention. Increased fire experience dictates that greater emphasis be placed on fire prevention through better tire maintenance on the road.

The motor vehicle fire problem should not be approached with a fatalistic attitude. The Interstate Commerce Commission notes that the records of thousands of carriers prove that fire accidents are preventable. They urge all concerned to take positive action and comment that: "no responsible carrier would refuse to take out insurance on his equipment because he had not had a fire loss, yet, many carriers neglect to take those courses of action which will do what conventional insurance can never do — prevent the fire."

Meeting of Board of Directors

New York, January 28, 1954

Present

ALLEN L. COBB, President
T. SEDDON DUKE, Vice-President
JOHN A. NEALE, Vice-President
HOVEY T. FREEMAN, Secretary-Treasurer
RICHARD E. VERNOR, Chairman

Warren J. Baker	John Kidde
A. L. Brown	Geo. J. Richardson
Loren S. Bush	F. D. Ross
P. E. Dannenman	Henry G. Thomas
E. Gaston	U. C. Young
A. Leslie Ham	

PERCY BUGBEE, General Manager, ROBERT S. MOULTON, Technical Secretary, HORATIO BOND, Chief Engineer, CHARLES S. MORGAN, Assistant General Manager, M. M. BRANDON, Chairman, Electrical Section.

1. General Manager Bugbee reported on plans for the 58th annual meeting to be held at the Statler Hotel, Washington, D. C., May 17-21, 1954. The plans as presented were approved and the General Manager was instructed to proceed accordingly in developing the program.

2. Treasurer Hovey T. Freeman reported on the finances of the Association indicating a healthy financial condition and increasing income from various sources. This report was accepted.

Executive Office Activities

3. Reports on various Executive Office activities were presented by members of the NFPA staff as follows:

a. Mr. Bugbee reported the largest membership in the Association's history with a total membership of 15,221.

b. Mr. Bugbee reported on the Sponsors' Committee and its activities expressing gratification that General Lucius Clay had accepted chairmanship of the committee.

c. Mr. Moulton reported on the publications of the Association indicating the widespread character of the educational and technical publications of the Association and the fact that this department of our activities is largely self-supporting. He also reported on the publication of the 11th edition of the Handbook of Fire Protection, citing the great assistance rendered by the members of the Handbook Advisory Committee and other cooperating NFPA members.

d. Mr. Morgan reported on advertising indicating an increasing income from this source.

e. Mr. Bugbee reported on the activities of the Public Relations Department and commended the work of the new Manager, Mr. Robert W. Schuette.

f. Mr. Bond reported on the Fire Service Department indicating the widespread activities of the Association in assisting and making contact with fire departments and commended the work of Mr. Warren Y. Kimball, Manager.

g. The work of the Fire Record Department and its Manager, Mr. Chester I. Babcock, were commended by Mr. Bugbee who reported on the extensive service rendered to members and others in this division of our activities.

h. Mr. Moulton reported on the special field service projects of the Association indicating that the activities of our Electrical Field Engineer, our Flammable Liquids Field Engineer, and our Gases Field Engineer, are all particularly useful in furthering our objectives in their respective fields. He explained that these projects are supported by special contributions and indicated the need for additional contributions, particularly to complete the budget of the gases field service project.

These reports were approved with an expression of appreciation to members of the NFPA staff for their conscientious work in the several subjects covered.

Report of NFPA Sections

4. Reports of NFPA sections were presented as follows:

a. Mr. Morgan, Executive Secretary of the Fire Marshals' Section, outlined the current activities of this group, reported on the meeting held in Detroit in December, and reported favorable reaction from these Association activities.

b. Chairman Merwin M. Brandon of the Electrical Section reported on the activities of this group, outlined the current program of the Electrical Section, and indicated that with the 1953 National Electrical Code so recently completed and work on the next edition not yet under way, there would be no occasion for a meeting of the section at the time of the 1954 NFPA annual meeting.

c. President John A. Neale of the Society of Fire Protection Engineers (NFPA professional section) reported on the growth and progress of the Society indicating a current membership of approximately 860.

The reports of the sections were approved with commendation.

Advertising Council Campaign

5. The Advertising Council campaign was covered in a report by General Manager Bugbee who described the extensive results secured in this campaign and outlined plans for further financing of this project through royalties from the use of the character *Sparky* for dolls and various other commercial promotions. He presented a contract with V.I.P., Inc., previously approved by the officers of the Association acting as the Advisory Committee by which V.I.P. would promote such uses of the character *Sparky,* all under the general direction of the Association. This contract was approved. It was further voted to appropriate an additional $10,000 for immediate activities in the Advertising Council campaign after it had been explained that the royalties from the *Sparky* promotion could not be expected to accrue for some time.

Regional Meetings

6. The NFPA regional conference held in Providence, R. I. on October 29 and 30 was discussed with comments from President Cobb, Vice Presidents Duke and Neale, Secretary-Treasurer Freeman and Board members Baker, Brown, Gaston and Thomas, all of whom were present and expressed their opinions as to the great value of this and other similar regional conferences in advancing the cause of fire protection in the area and promoting NFPA activities.

7. Plans were outlined for the next regional conference to be held in Seattle, Wash., September 20-22, 1954.

Farm and Industrial Activities

8. Mr. Bugbee reported on the proposed farm field engineering service project indicating lack of adequate financial support to date but expressing the hope that some support might be forthcoming in due time. The Board expressed approval of the objectives and instructed the General Manager to continue efforts to secure additional financial support.

9. Mr. Cobb, speaking as Chairman of the Industrial Committee, reported a successful meeting of this group.

Technical Committee Activities

10. It was voted to confirm the technical committee appointments made on recommendation of the Committee on Technical Committee Procedure and incorporated in the 1953-54 Year Book pursuant to the action of the Board at its last meeting. It was also voted to confirm the committee appointments submitted to the Board with the agenda. Certain additional committee appointments were approved, subject to favorable recommendation by the Committee on Technical Committee Procedure.

11. Chairman A. L. Brown reported for the Committee on Technical Committee Procedure emphasizing the value of the continuing devoted service rendered by well over 1,000 individual members of NFPA committees serving on 100 different technical committees responsible for the development and revision of about 180 individual NFPA standards. In

addition to the above action on committee appointments, the Board approved the following recommendations:

a. Authorization to the Committee on Flammable Liquids to create within its structure an additional sectional committee to deal with solvent extraction and recovery processes, preparing such standards or other reports on this subject as they deem appropriate.

b. Appointment of a new Committee on Non-Sparking and Conductive Floors to deal with flooring in industrial and other occupancies in addition to the present well considered NFPA standard on hospital operating room floors. This committee is to be an independent group or to be constituted as a subcommittee of the Committee on Building Construction, whichever may appear appropriate.

c. The hazard of certain cotton rugs which are reported as being particularly subject to accidental ignition was referred to the Committee on Wearing Apparel for consideration and report to the Board as to what action, if any, might be appropriate.

d. Establishment of a new Committee on Hose reporting to the Association through the Committee on Fire Department Equipment to deal with performance standards for all types of hose giving particular consideration to recently developed new types of hose utilizing synthetic fibres.

e. Discharge of the Committee on City Planning and Zoning with an expression of appreciation to this committee for its previous work. This action was taken on the ground that the committee has currently been inactive and its functions may be covered by other committees.

Action on Committee Reports

12. It was voted to confirm the results of the following letter ballots taken since the last meeting of the Board:

a. Approval of Standards for Storage and Handling of Cellulose Nitrate Motion Picture Film (NFPA No. 40).

b. Approval of Revisions in the Standards for Incinerators (NFPA No. 82).

c. Approval of Revisions in Fire Prevention Standards for Homes and Camps in Forested Areas (NFPA No. 224).

13. Chairman Henry G. Thomas of the Committee on Fire Department Equipment presented revisions in Standard No. 191, Portable Pumping Units, which were submitted to the Board in accordance with the action of the last annual meeting of the Association. Mr. Thomas stated that complete agreement had been reached in the committee on the following changes in the text printed in the 1953 Advance Reports:

Par. 2. Change weight figure from 185 pounds to 200 pounds.

Par. 5. Revise to read:

5. *Pump Body.* The pump body shall withstand a hydrostatic pressure of 100 pounds per square inch over rated operating pressure.

These revisions were adopted.

14. It was voted to discharge the Committee on Fire Prevention Education for Elementary Schools on the ground that the committee has been inactive and its functions are being well covered in other ways, particularly through the work of the National Education Association.

15. It was voted to discharge the Committee on Long Range Planning on the ground that its objectives have been secured and that there is no occasion for its continuance.

16. Mr. Bond made a comprehensive report on Civil Defense and related government activities which were discussed by Mr. Duke and others.

17. Mr. Bugbee presented the resignation of Board member J. E. Frederickson of the General Motors Corporation. There followed a general discussion of the activities of the NFPA office in connection with the General Motors fire at Livonia, Mich. and the publication of the NFPA report thereon. At the conclusion of the discussion, the Board extended a vote of confidence to General Manager Bugbee and the NFPA staff for their handling of this matter.

18. Mr. Cobb reported on various developments of interest including a proposed conference at the Massachusetts Institute of Technology next August on fire protection engineering matters and on work of the Manufacturing Chemists Association in cooperation with the NFPA.

The 24 "Worst" U. S. Cities

By Robert S. Moulton
Editor of the Quarterly

Twenty-four cities in various parts of the United States have been labeled "worst" in a recently published popular magazine article. Many more have been labeled "poor" or "fair" and a relatively small number as "good," all on the basis of per capita fire loss statistics incorrectly attributed to the National Fire Protection Association.

For many years we have been publishing annual compilations of fire department reports from U. S. and Canadian cities giving information about numbers of fires, losses, etc. We have felt that this dissemination of fire record information was a helpful contribution in the public interest. The many requests we have received for such information on a city by city basis, provide evidence of the importance of these figures. The information compiled is largely that taken from public records; what we are doing is essentially the performance of a compilation service. Having these figures available eliminates a great deal of trouble and correspondence which would otherwise be necessary on the part of our members and others who would have to assemble their own information from available public records.

Comparisons Between Cities

It should be recognized that the material compiled is not in such form as to be particularly useful for valid comparisons between cities. Such comparisons can properly be made only when many other factors are considered beyond those presented in the tables. Relative fire losses must be interpreted in the light of different conditions in different cities. Furthermore, it should be noted that the fire loss figures which we have regularly reprinted are primarily those supplied by the fire departments themselves on the basis of their own estimates of losses. We have tried to encourage uniform reporting practices and have continually emphasized the fact that fire loss records should include all losses in the city whether insured or uninsured, and whether involving buildings or other property. Furthermore, we have emphasized the importance of making reasonably accurate estimates of losses after checking with information from all available sources rather than setting down figures just on the basis of an offhand guess. However, there is in the picture nothing to compel any fire department to report fire losses accurately and in general no way to check the figures if one fire chief presents a more favorable report than his neighbor due to an honest difference of opinion as to methods of reporting, or by simply under-estimating fire losses. In the course of our compilation of these reports over the years, we have discovered that some fire departments have had the notion that they should report only such losses as are not covered by insurance on the theory that these are the only losses which fall on their citizens, the insured losses being paid by the insurance companies. Other cities have had the theory that only insured losses should be reported. We have called such inconsistencies to the attention of reporting fire departments from time to time and most of such inconsistent reporting practices have been eliminated. However, we still know that the figures are not prepared on an equal basis and that comparisons based on them may be dangerous.

Per Capita Losses

We have been particularly concerned about per capita fire loss figures. Per capita losses are a very convenient index of relative conditions, but are subject to so many abuses that we discontinued publishing them years ago. In fact, some of our members would like to see us discontinue publishing all fire loss figures because of the possibility of their abuse. Thus far, however, we have felt that the good that might come of publishing fire department reports more than offsets the damage and that if we did stop publishing the reports, the abuses would continue as anyone else could compile the same information from public records.

Save Your Family from Fire

This year our confidence in the whole set-up has been considerably shaken by the publication of an article in the April issue of Woman's Home Companion under the title "Save Your Family from Fire." The article appears to be intended as a contribution towards life safety from fire, but includes under the heading "How Well Can Your Town Protect You" a listing of cities rated "Worst," "Poor," "Fair" and "Good," based upon average per capita fire losses dating back to 1946 and incorrectly attributed to the NFPA as follows:

> "The cities above were rated according to average fire loss per person since 1946. This is a recognized method of measuring the fire-fighting effectiveness of any community, according to the National Fire Protection Association. Nationally, our average fire loss per person was $3.44 in 1952, the last year for which figures are available. Your city was judged "good" if its average loss was held under $2.50; "fair" if between $2.50 and the national average, $3.44; "poor" if the loss was worse than the national average."

Actually the NFPA does not rate cities and, in any case, we cannot see how per capita fire loss in dollars has any relation whatsoever to the ability of any fire department to perform rescue operations and other life safety functions which is the principal topic of the article. If we were to follow this fallacious reasoning, we would conclude that the citizens of Livonia, Mich. are in a most precarious situation and can expect nothing from their fire department just because due to one multi-million dollar fire which was beyond the capacity of any fire department, the per capita fire loss in Livonia is probably the highest of any city in the world. This dubious distinction obviously does not reflect in any way upon the Livonia Fire Department, nor does it indicate that the citizens of Livonia are in any more immediate personal danger from fire than are the citizens of thousands of other communities.

A Look at the Record

These relative ratings of cities published by the Woman's Home Companion which were attributed to the NFPA were apparently largely taken from the Municipal Year Book published by the International City Managers' Association, edition of 1948, with subsequent additional figures to bring some of the statistics more nearly up to date. The Municipal Year Book figures in turn were originally secured from fire department sources, via the NFPA, but the Municipal Year Book added their own computations of per capita fire losses for which the NFPA was not in any way responsible. Apparently the author of the article in question did not distinguish between a signed statement by Mr. Percy Bugbee, General Manager of the NFPA, which is printed at the beginning of the fire section of the Municipal Year Book, and the subsequent material in the Year Book

prepared by the City Managers' Association's staff.

In an effort to counteract some of the damage that may have been caused to the fire departments incorrectly given adverse ratings in this Woman's Home Companion list, we think it appropriate to look at the record of this same group of cities. We are accordingly discussing below the 24 cities listed as "Worst." Time and space do not permit a similar analysis of the cities in the balance of the list, but we have every confidence that the results would be similar because we can honestly say that we feel that the fire service of the country is improving, not deteriorating, and that fire departments all over the country are doing a progressively better job in their field. There are, of course, great differences between individual fire departments, differences due to varying character of cities, and the amount of support that the fire department gets from the city administration; structural conditions vary, hazards vary, and losses consequently vary. From the point of view of life safety, however, we have yet to hear of any case where loss of life by fire has been directly charged to fire department inefficiency, excluding those cases where owing to lack of municipal appropriations the manpower and equipment may not have been adequate for simultaneous rescue of many people endangered in a fire in a large building, and possible occasional instances of errors of judgment which are bound sometimes to occur as we are all only human.

Now let us proceed to analyze the record of these 24 "Worst" cities. In this analysis we are using the same information that was available to the author of the Woman's Home Companion article, that is, the Municipal Year Book and the NFPA Quarterly, supplemented by a few incidental comments based upon personal knowledge of the conditions in these several cities on the part of your editor and other members of the NFPA staff. We will start across the map from left to right.

California

Bakersfield. This progressive California city, far from being among the worst, has a very good fire department, its excellence being attested by the low number of deficiency points attributed to the fire department by application of the "Standard Schedule for Grading Cities and Towns of the United States with Reference to Their Fire Defenses and Physical Conditions" of the National Board of Fire Underwriters. This information, printed on the same page of the 1948 Municipal Year Book which contains the per capita fire loss figures used by the author of the article, shows the Bakersfield department stands third in its population group of all cities in the country. The information published in the 1953 Municipal Year Book shows that the Bakersfield department has the lowest number of deficiency points of all cities in its population group, and, of all U. S. cities over 25,000 in population, only 9 cities have fire departments grading better. Furthermore, if the author had looked at the current fire loss records instead of an average dating back to 1946, he would have seen that in the last two years Bakersfield has shown a substantial decrease both in number of fires and in dollar loss.

Stockton. The fire department, due to budget limitations, lacks sufficient manpower and equipment to meet fully the standards for a city of this size but is doing an excellent job in fire prevention. Stockton received the first award among California cities for excellence in Fire Prevention Week observance in 1953, and in the past five years of this contest, every other year has been tied for first place with some other California city, has been in second place, or has received Honorable Mention. We have already said we don't take much stock in per capita fire loss statistics, but it is interesting to note that if we look at the 1953 record instead of the average dating back to 1946 we find that Stockton has a per capita loss of $1.90 which is well below the national average. The fire department reports for the last three years show six deaths by fire in 1951, 4 in 1952 and only 1 in 1953. If we apply the slide

rule to these figures, we show an 83 1/3% decrease in fire fatalities since 1951.

Washington

Spokane. When your editor was last in Spokane, he was particularly impressed with the aggressive fire prevention program conducted by the fire department with a dozen active men working in the fire prevention bureau, concentrating primarily on life safety features. The high average per capita fire loss is the result of one hotel fire in 1950 which accounted for an additional $10 per capita that year. In this fire, the fire department concentrated on life safety and deferred fire extinguishing operations until sure that all occupants were rescued. Would anybody in Spokane feel safer if the fire department had kept the dollar loss down by concentrating on fire extinguishment to the neglect of rescue operations?

Tacoma. While on a statistical basis going back to 1946 Tacoma's fire losses are above the national average, the fire department for several years has been conducting an aggressive fire prevention and training program with the result of substantial reductions in the numbers of fires and in fire losses. Worst? Nuts!

Texas

Five of the "worst" cities are in Texas. Many cities in this state have been growing rapidly in recent years and in many cases municipal services, including the fire department, have not been able to keep pace with the growth of the city. Another factor, however, may be even more important in the statistical record and that is the peculiar fire insurance rating plan of this state whereby fire insurance loss payments are by law directly reflected in insurance rates, a fact which stimulates complete fire loss reporting, including insurance losses paid on fires where the fire department was never called and which in other states might not get into the records at all.

Abilene. The fire department, generally well equipped, has almost doubled in manpower in the last five years. The city enjoys a 10% insurance credit for a favorable fire loss ratio.

Amarillo. Here is another fire department which has expanded to meet the growth in city population and likewise enjoys a 10% insurance rate credit for a favorable fire loss ratio.

Dallas. Maybe the dollar loss statistics of Dallas are not the best in the country, but it will take a lot more than statistics to erase from your editor's mind the memory of the wreckage of a hospital which he inspected in company with the Chief after a fire there a couple of years ago when all the patients in a large 4-story hospital of ancient construction were evacuated under very difficult conditions without a single fatality. Credit the fire department for efficient rescue work, also for fire prevention work in cooperation with the hospital before the fire, and likewise the over-all organization job that resulted in the effective coordination of all municipal services in the non-rescue operations.*

Fort Worth. Another city with a 10% insurance rate credit for low fire losses. In one year the Fire Department made more than 60,000 fire prevention inspections and secured the correction of 10,000 fire hazards.

Waco. Per capita fire loss figures are of dubious value at best, but if they are to be used, why not consult current sources of information? The 1953 Municipal Year Book (latest published to date) reports Waco with an average per capita fire loss of $2.93, compared with a median figure of $3.11 for all cities in this population group.

Arkansas

Little Rock. This city has not reported its fire losses in dollars for the past two years, perhaps because of fear that per capita fire loss figures might be misused in odious comparisons. The features of fire department operation upon which the city does report seem quite normal. We think we could sleep just as peacefully in Little Rock as in any other city.

Iowa

Des Moines. The published statistics of fire losses did not check with our understanding that Des Moines really has a pretty good fire department so we turned to the latest fire department report in our files

*See January 1952 **Quarterly**, Page 232.

to get the answer. Incidentally, this report, dated January 1, 1953, is a public record available to anyone interested. This report is unusual in the detail and completeness with which fire loss statistics are presented and apparently reflects a sincere effort to get the complete fire loss picture on every fire. This report includes uninsured losses on buildings and contents of over $300,000, also losses in automobile fires and other categories not included in the fire loss totals reported by some other cities. We also note that in the year in question two large loss fires accounted for almost half of the total, both being cases where due to a combination of the factors of combustible construction and contents, large area and delay in detection, no fire department could have been expected to prevent major losses. This is just another case where the short-cut method of comparison of cities by means of per capita fire loss figures gives misleading results.

Louisiana

Alexandria. While fire losses in prior years here have been running above the national average, we can congratulate the city on its 1953 record, which shows substantial improvement and this year is well below the national average per capita.

Illinois

Springfield. Conditions in the Springfield fire department were at a low ebb a few years ago, but current reports show real improvement. Anyway, we don't see that Springfield can be rated "worst" on a per capita fire loss basis, as for the past ten years Springfield's per capita losses have averaged less than the national average.

Indiana

East Chicago. This city has industrial hazards which are large in relation to the population, a fact which tends to distort per capita fire loss figures. Even so, we note that the latest Municipal Year Book reports East Chicago as having an average annual per capita loss of $2.93 as compared with the median figure of $3.11. Not that per capita loss figures mean much anyway, but if they are to be used at all they certainly provide no justification for calling this city "worst."

Michigan

The three cities in Michigan listed among the "worst" in the country all have fire departments of moderate size which due to municipal budget limitations do not have either the manpower or the equipment to do a complete job, a fact which the fire departments themselves will recognize and are trying to overcome by special training of their men and other measures to improve efficiency.

Ann Arbor is a city which is giving special attention to training and to fire prevention inspections. A large new fire station was added last year. The high esteem in which Ann Arbor is held in Michigan is shown by the fact that this city is host to the annual Michigan Fire College.

Battle Creek is another city where the fire department is handicapped by insufficient manpower. The interest and devotion of the fire department officers to their job, however, is shown by the fact that these men have done much fire prevention work in their time off.

Bay City has made progress in meeting deficiencies in fire department manpower; the personnel has been increased by 17 since the 1948 Municipal Year Book was published.

Ohio

Springfield. Another city where per capita statistics don't tell the real story. This fire department has made great strides in 1953 with new equipment, new headquarters and training facilities. An aggressive fire prevention program has eliminated many hazards, particularly in the high value district and a number of dilapidated buildings have been removed. A current campaign for automatic fire detection systems in dwellings, should pay dividends in improved fire safety in years to come.

West Virginia

Charleston did have some large loss fires, the kind that no fire department can handle without large loss when they are not called immediately. However, the 1953 fire loss of $149,000 total is well below the national average for a city of about 75,000 population. What's all the excitement about?

Huntington has not at this writing reported their 1953 fire losses. Perhaps this is

another city that doesn't want do-gooders to use per capita fire losses as a measuring stick against them. To be sure, the 1946-1952 average was not good, but during the past winter twenty more firemen were added to the Huntington fire department, and four new pumpers purchased. Why worry?

Maryland

Baltimore. On the basis of statistics Baltimore does not look too good, but an analysis of the actual fire record shows that the large aggregate loss figures are largely due to a few big fires in old market and warehouse buildings, cases where the fire department was not called until the fire was beyond the control of any fire department. Furthermore, municipal appropriations for the fire department have been increased, providing an increased schedule of salaries more in line with other cities in Baltimore's class, and a new chief is working actively to improve conditions. Things seem to be looking up . . . Next!

New Jersey

Atlantic City is the traditional example we have used for years to show how phony per capita figures can be. The average per capita loss 1946-1953, based on census population figures, was $16.25. The total was swelled by $1,697,000 in 1952 by fire that started in a 6-story wooden hotel closed for the winter; fire was not discovered until the building was pretty completely involved.

The U. S. Census, 1950, says that Atlantic City has a population of 61,642. However, the number and value of buildings in the city is commensurate with the peak summer population of 360,000. Figured on this basis, the per capita loss 1946-1953 is $2.80.

Passaic is another city where the per capita figures distort the picture, because this city has a lot of heavy industry within its city limits, but many of the people who work in Passaic live in other communities. An average fire loss which does not seem excessive in proportion to the total values of the physical property in the city, may appear abnormal when divided by the number of people who actually live in Passaic according to the census.

Maine

Bangor is the last in our list of "worst" cities. The idea that your family is not safe from fire here just because the per capita fire loss was above some arbitrary figure dating back to 1946 is just as screwy as when we started this list with Bakersfield, California, and would still be if we had time to continue on with cities labeled "poor" and "fair." Bangor was established in early Colonial days as the port at the head of navigation on the Penobscot River. As in many other New England cities of about the same age, there are still many old buildings in Bangor which are quite a headache to the fire department. Nevertheless, the department is doing a conscientious job, and last year kept the loss on buildings and contents down to $95,000. We would prefer to stop here, but if you want to use the slide rule you will find that Bangor's current per capita loss is well below the national average for cities in this population group.

We fully realize that all cities are not equally good in the fire protection facilities available. In most cases where there are deficiencies, the situation simply reflects the extent of the interest and demand for fire safety on the part of the citizens. No city on the list is 100% safe from fire and it is clearly in the interests of every citizen to provide constructive support for his fire department and work with the local authorities towards improvements in fire-safety.

Fire Record of Cities, 1953

As Reported by Municipal Authorities

The following tables summarize the fire experience for 1953 in 656 of the 699 cities with population over 20,000 in the United States and Canada.

These statistics have been collected and published in the April QUARTERLIES since 1939 and represent a permanent reference for members who desire to determine fire experience trends within a particular city by comparing present with past experience. These tables should not be used as a basis of comparisons among different cities, as comparisons based on these statistics are misleading. The principal discrepancy results from the wide variation among fire officials as to what constitutes a fire loss. Certain reports include only insured losses, others only uninsured. Whether or not property is insured, of course, has no bearing on the actual value of property destroyed. Variations in degree of industrialization, differences in topography, climate and age of cities also influence the fire record. In other words, fire losses reflect the composite results of many different factors in addition to fire department efficiency and therefore the practice of making comparisons among different cities based on these data is to be discouraged.

Fire departments of 559 United States cities and 46 Canadian cities of over 20,000 population have reported their estimates of fire loss, fire alarms, building fires, and false alarms for 1953 to the NFPA Department of Fire Record.

A total of 584 United States cities having more than 20,000 population reported a fire loss for the year 1953 of $203,940,209. Fifty-two Canadian cities having a total population of 4,839,403 reported a loss of $21,620,409 for 1953.

The average loss per person in the 584 U. S. cities reporting losses was $3.86, 12.2 per cent more than the $3.44 average loss in 1952. The per capita loss in the 52 Canadian cities reporting losses was $4.47, a 6.9 per cent increase from 1952.

The average loss per building fire in 348 U. S. cities for 1953 was $867, compared with $795 in 1952. The average building fire loss in 42 Canadian cities was $1,075 in 1953, $975 in 1952.

The total number of building fires reported by 581 U. S. cities was 263,734, an average of 4.2 fires per 1,000 population, as compared with 4.3 building fires per 1,000 population in 1952 and 4.08 in 1951. Fifty-two Canadian cities reported 19,864 building fires in 1953. The number per 1,000 population was 4.13 in 1953 as compared with 3.68 in 1952.

Motor vehicle fires reported by 574 U. S. cities totaled 66,915, an average of 1.08 fires per 1,000 population. Fifty Canadian cities reported 3,070 motor vehicle fires, 0.66 per 1,000 population.

Fire departments in 589 U. S. cities of more than 20,000 population answered 871,026 alarms in 1953. The number of alarms in 51 Canadian cities was 52,569.

In the United States, 583 cities of over 20,000 reported 70,228 false alarms in 1953. This was 8.1 per cent of the total calls. It will be noted that these are "malicious false alarms," not cases where smoke or steam, etc., was honestly mistaken for fire. The 6,153 false alarms reported by 49 Canadian cities were 11.5 per cent of their total calls.

Fire departments have been very cooperative in furnishing fire loss figures. Most of the 43 nonreporting cities did not record their fire experience. A number of loss figures are preliminary estimates.

1953 FIRE LOSSES, CITIES OF 20,000 POPULATION AND OVER

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
ALABAMA							
Anniston	31,150	221,739	550	233	66	19	7.5
Bessemer	28,471	45,586	206	56	17	0	2.0
Birmingham	298,720	1,095,307	4,814	1,206	.....	405	4.0
Dothan City	21,556	58,604	407	193	34	7	9.0
Florence	23,832	.....	.....	.....	.....	.....	.....
Gadsden	55,528	167,307	971	278	31	35	5.0
Mobile	127,151	913,395c	1,299	654	147	94	5.1
Montgomery	195,098	279,349d	1,045	499	77	63	2.6
Phenix City	23,285	.....	.....	.....	.....	.....	.....
Selma	22,629	32,668	250	173	19	5	7.7
Tuscaloosa	46,364	59,444	530	198	70	27	4.3
ARIZONA							
Phoenix	105,042	553,906c	1,835	499	201	92	4.7
Tucson	45,064	176,688	1,154	95	70	148	2.1
ARKANSAS							
El Dorado	23,047	119,009	310	113	27	23	4.9
Fort Smith	47,864	350,833	1,015	210	40	20	4.4
Hot Springs	29,298	163,492	454	177	55	13	6.1
Little Rock	101,387	.....	.....	.....	.....	.....	.....
North Little Rock	42,142	1,241,450	968	196	52	13	4.7
Pine Bluff	37,147	119,067d	855	314	59	9	8.5
CALIFORNIA							
Alameda	63,425	114,261	.....	.....	.....	.....	.....
Alhambra	51,284	74,963	475	112	60	53	2.2
Arcadia	23,041	49,492	409	79	37	1	3.4
Bakersfield	34,540	181,751	971	138	94	93	4.0
Berkeley	113,217	301,355	1,843	493	88	73	4.4
Beverly Hills	28,915	197,620	443	141	74	42	4.9
Burbank	78,318	1,004,486	898	334	109	11	4.3
Compton	47,893	59,390	711	150	82	9	3.1
Eureka	22,913	752,285	325	102	24	75	4.5
Fresno	90,618	905,252c	845	267	.....	94	2.9
Glendale	95,398	176,210	1,071	296	136	100	3.1
Huntington Park	29,376	71,208c	258	57	37	14	1.9
Inglewood	46,046	93,274	878	169	75	13	3.7
Long Beach	244,072	210,760	2,081	.....	.....	174	.....
Los Angeles	1,957,692	.....	30,952	9,452	271	1,925	4.8
Los Angeles County	2,193,995	3,014,965	11,135	2,303	950	589	1.1
Lynwood	25,534	34,303	291	80	32	17	3.1
Menlo Park Fire Dist.	55,000	101,635	747	147	33	16	2.7
Monrovia	20,274	72,564	411	82	28	6	4.0
Montebello	21,754	20,817c	298	69	33	0	3.2
Monterey Park	20,113	19,733	283	52	25	11	2.6
National City	21,132	13,482	297	67	45	0	3.2
Oakland	380,576	2,256,234	5,240	1,558	207	682	4.1
Ontario	22,823	40,284	371	44	33	72	1.9
Oxnard	21,159	11,261c	155	61	26	4	2.9
Palo Alto	25,290	23,185	447	138	34	29	5.5
Pasadena	104,085	82,545	1,098	381	144	112	3.7
Pomona	35,157	38,145	747	85	60	48	2.4
Redondo Beach	25,208	10,817	394	191	45	7	7.6
Redwood City	25,342	41,054	630	81	42	12	3.2
Richmond	99,218	161,345	1,770	143	68	84	1.4

c. Building and contents only. d. Insured loss only.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
CALIFORNIA (Continued)							
Riverside	46,399	93,301c	642	128	66	17	2.8
Sacramento	135,761	460,407c	1,272	609	198	122	4.5
San Bernardino	62,792	531,075c	1,148	271	111	40	4.3
San Diego	321,485	1,045,519c	4,094	1,226	377	161	3.8
San Francisco	760,753	.....	11,139	3,573	610	1,727	4.7
San Gabriel	20,204	25,080	163	66	24	3	3.3
San Jose	95,044	204,488	1,476	240	54	137	2.5
San Leandro	27,498	140,948	401	97	34	4	3.5
San Mateo	41,536	106,783c	594	159	50	9	3.8
Santa Ana	45,534	113,615c	598	165	43	36	3.6
Santa Barbara	44,764	36,652c	752	152	71	27	3.4
Santa Cruz	21,848	147,450	387	87	32	17	4.0
Santa Monica	71,299	103,669	1,094	332	105	56	4.7
South Gate	50,684	145,429c	708	196	71	2	3.8
Stockton	71,660	137,904c	1,435	336	99	59	4.7
Torrance	22,206	82,103	478	86	38	.....	3.8
Vallejo	23,164	15,655	1,118	167	59	146	7.2
Whittier	23,866	171,160	297	82	46	0	3.4
COLORADO							
Colorado Springs	45,268	89,041	531	230	68	44	5.1
Denver	412,856	990,000a	3,400	1,706	354	293	4.1
Greeley	21,000	54,762	232	100	21	5	4.8
Pueblo	63,561	1,536,869c	1,005	407	129	54	6.4
CONNECTICUT							
Bridgeport	159,352	321,000e	1,835	588	346	94	3.7
Bristol	35,893	160,523c	444	133	50	23	3.7
Danbury	22,424	36,064	456	202	38	11	9.0
East Hartford	29,340	41,350	566	72	152	19	2.5
Fairfield	30,370	19,589	255	26	28	0	0.9
Greenwich	40,546	158,337	1,129	157	63	11	3.9
Hamden	29,311	97,707	524	42	41	19	1.4
Hartford	177,073	333,746	2,667	691	273	217	3.9
Meriden	43,747	62,992	603	194	41	25	4.4
Middletown	29,665	.....	.....	.....	.....	.....	.....
Milford	26,345	202,945	721	148	53	13	5.6
New Britain	73,663	200,000a	943	235	49	45	3.2
New Haven	163,344	590,888	2,810	866	201	178	5.3
New London	30,367	119,274c	646	103	76	18	3.4
Norwalk	49,458	131,777	765	223	65	38	4.5
Norwich	23,382	48,195	519	131	29	11	5.6
So. Manch'r Fire Dist.	33,906	25,004	254	55	12	5	1.6
Stamford	73,584	.....	.....	.....	.....	.....	.....
Stratford	23,620	43,575	606	91	33	1	3.9
Torrington	27,770	83,730	332	87	22	4	3.1
Waterbury	104,242	240,035	1,750	393	138	81	3.8
West Hartford	44,401	95,452	544	166	33	14	3.7
West Haven Twp.	31,876	42,438	589	18	22	59	0.6
DELAWARE							
Wilmington	109,907	613,355	1,464	748	190	92	6.8
DISTRICT OF COLUMBIA							
Washington, D. C.	797,670	1,901,185	10,628	2,897	696	1,087	3.6
FLORIDA							
Daytona Beach	29,254	46,392	422	91	18	18	3.1
Fort Lauderdale	40,000	92,736	545	88	39	24	2.2
Gainesville	26,577	88,900	209	108	29	7	4.1

a. Estimated. c. Building and contents only. e. Subject to change.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
FLORIDA (Continued)							
Jacksonville	198,800	446,353	2,915	689	138	163	3.5
Key West	21,724	21,760	259	.....	14	4	.....
Lakeland	30,846	23,675	402	198	37	26	6.4
Miami	246,983	826,375	2,926	593	202	121	2.4
Miami Beach	45,541	35,000c	625	211	69	47	6.0
Orlando	51,826	188,838	698	75	56	69	1.4
Panama City	26,248	92,370	445	187	39	7	7.1
Pensacola	43,293	80,291	449	201	45	18	4.7
St. Petersburg	95,712	131,696c	1,321	276	82	11	2.9
Tallahassee	27,158	65,239	564	81	49	12	3.0
Tampa	124,073	1,788,120	1,605	479	142	256	3.9
West Palm Beach	43,053	140,545	381	90	40	10	2.1
GEORGIA							
Albany	30,987	18,593	660	393	99	19	12.7
Athens	20,102	57,722	366	18	46	31	0.9
Atlanta	327,090	1,689,836	6,163	1,953	571	112	6.0
Augusta	71,507	202,628	1,063	573	146	71	8.0
Columbus	79,510	56,813c	717	377	90	73	4.7
Decatur	21,626	33,725	200	80	14	8	3.7
East Point	21,628	103,430	378	106	28	43	4.9
La Grange	24,954	199,152	308	126	48	5	5.1
Macon	70,106	398,840	689	497	68	62	7.1
Marietta	20,628	28,617c	272	125	22	0	6.1
Rome	29,617	55,535	472	233	45	18	7.9
Savannah	119,689	423,586	1,564	1,098	128	170	9.2
Valdosta	20,004	30,553	378	160	30	3	8.0
IDAHO							
Boise	34,152	31,428	594	87	23	22	2.6
Pocatello	25,882	14,840c	265	166	20	16	6.4
ILLINOIS							
Alton	32,176	96,500	508	248	55	5	7.7
Aurora	50,508	394,929	784	168	68	32	3.3
Belleville	32,701	224,246	515	146	59	0	4.5
Berwyn	51,176	154,400	516	86	20	11	1.7
Bloomington	34,048	71,847	665	151	60	42	4.4
Champaign	39,397	55,631a	339	180	55	14	4.6
Chicago	3,606,436	8,750,000	46,967	22,472	5,775	3,243	6.2
Chicago Heights	24,369	142,663	198	124	14	23	5.1
Cicero	67,197	495,475c	1,067	422	78	65	6.3
Danville	37,892	782,451	1,022	250	57	9	6.6
Decatur	67,803	146,847	638	346	81	9	5.1
East St. Louis	81,950	317,651	1,487	583	146	162	7.1
Elgin	42,003	131,332c	527	87	38	25	2.1
Elmhurst	21,204	22,875c	162	44	12	4	2.1
Evanston	73,030	141,702	807	288	65	30	3.9
Freeport	22,425	45,964	347	43	26	13	1.9
Galesburg	31,357	213,440	357	133	32	4	4.2
Granite City	29,139	.....	.....	.....	.....	.....	.....
Harvey	20,636	39,509	396	106	34	20	5.1
Jacksonville	20,374	123,082	249	34	42	3	1.7
Joliet	52,460	148,653	1,220	293	55	38	5.6
Kankakee	25,873	198,895	674	67	23	12	2.6
Maywood	27,409	91,010	288	85	24	0	3.1
Moline	37,296	97,966	548	187	53	61	5.0
Oak Park	63,175	138,320	1,187	267	38	13	4.2
Ottawa	22,000	82,020	161	44	35	11	2.2
Pekin	21,912	19,582	216	94	30	2	4.3

a. Estimated. c. Building and contents only.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
ILLINOIS (Continued)							
Peoria	111,523	220,264	1,517	542	172	138	4.9
Quincy	41,402	82,725	697	130	47	28	3.1
Rockford	92,503	181,211	1,244	489	126	7	5.3
Rock Island	48,594	100,799	628	102	35	21	2.1
Springfield	80,832	229,369	1,082	512	100	28	6.3
Urbana	22,995	17,287	265	91	57	5	4.0
Waukegan	39,099	192,611	963	214	53	16	5.5
INDIANA							
Anderson	46,809	98,539	1,056	271	27	101	5.8
Bloomington	28,191	96,380	498	176	51	.....	6.3
East Chicago	54,124	246,865	1,340	.....	77	91	.....
Elkhart	35,556	117,480	1,001	349	52	28	9.8
Evansville	109,869	1,006,330	2,329	1,067	165	196	9.7
Fort Wayne	132,840	279,153d	2,182	965	307	102	7.3
Gary	132,496	215,762	2,518	713	142	291	5.4
Hammond	87,423	166,626	1,966	481	119	106	5.5
Indianapolis	424,683	1,303,086	6,012	2,532	592	423	6.0
Kokomo	38,600	71,424	587	259	71	49	6.7
Lafayette	35,508	105,127	652	67	98	5	1.9
Logansport	20,933	93,814	593	279	65	50	13.3
Marion	30.059	97,450	510	272	62	35	9.1
Michigan City	28,379	146,525	486	204	39	12	7.2
Mishawaka	32,878	34,661	527	154	52	34	4.7
Muncie	58,364	240,000a,c	1,040	458	123	52	7.9
New Albany	29,297	274,220	538	289	39	28	9.9
Richmond	39,504	21,880	644	217	69	14	5.5
South Bend	115,698	.....	.....	.....	.....	.....	.....
Terre Haute	64,047	1,083,551	1,578	498	143	70	7.8
IOWA							
Ames	23,105	10,682c	232	115	20	10	5.0
Burlington	30,639	309,783	519	156	48	2	5.1
Cedar Rapids	72,149	161,736	993	430	73	27	6.0
Clinton	30,151	83,292	743	213	56	12	7.1
Council Bluffs	45,184	109,882	667	204	59	42	4.5
Davenport	73,640	167,112	1,186	212	91	86	2.9
Des Moines	176,954	703,884	2,919	690	223	102	3.9
Dubuque	49,528	58,505	877	311	58	21	6.3
Fort Dodge	25,025	46,851	326	78	42	29	3.1
Iowa City	27,018	399,508	322	96	26	2	3.6
Marshalltown	20,000	20,685	220	108	24	8	5.4
Mason City	27,593	44,134	435	95	34	3	3.4
Ottumwa	33,640	243,392c	762	160	43	4	4.8
Sioux City	84,035	642,399	1,014	421	63	49	5.0
Waterloo	64,354	100,879	949	361	87	81	5.6
KANSAS							
Hutchinson	33,524	284,196	547	162	76	3	4.8
Kansas City	129,583	1,315,483	2,061	601	226	70	4.6
Lawrence	23,292	27,248	311	.....	.....	18	.....
Leavenworth	20,543	71,344	463	121	43	4	5.9
Pittsburg	25,134	147,269c	442	97	37	3	3.9
Salina	26,141	118,919	496	227	45	8	8.7
Topeka	77,827	515,936c	917	282	102	77	3.6
Wichita	166,306	540,850	2,848	674	271	39	4.0

a. Estimated. c. Building and contents only. d. Insured loss only.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
KENTUCKY							
Ashland	31,228	81,291	450	93	36	17	3.0
Covington	64,282	65,328c	844	.....	75	33	.....
Lexington	54,449	.....	.....	.....	.....	.....	.....
Louisville	367,359	1,321,115b	4,924	2,283	574	243	6.2
Newport	31,015	16,759	505	209	83	39	6.7
Owensboro	33,983	36,942c, e	621	289	.....	23	8.5
Paducah (f)	32,430	1,361,368	1,171	373	88	53	11.5
LOUISIANA							
Alexandria	34,685	70,670	423	59	47	51	1.7
Baton Rouge	123,957	213,277	1,555	467	111	156	3.8
Lafayette	33,465	51,902	292	108	30	7	3.2
Lake Charles	41,202	.....	.....	.....	.....	.....	.....
Monroe	38,375	226,446a, c	1,040	219	64	61	5.7
New Orleans	567,257	1,609,274	4,940	1,202	204	250	2.1
Shreveport	125,506	534,643	1,422	697	125	100	5.5
MAINE							
Auburn	23,078	67,000	505	95	113	6	4.1
Augusta	20,900	139,287	359	153	18	7	7.3
Bangor	31,473	95,126c	676	351	55	56	11.2
Biddeford	20,700	58,845	473	200	22	0	9.6
Lewiston	41,142	311,359	722	294	44	4	7.2
Portland	76,936	101,990	1,822	155	114	80	2.0
South Portland	21,732	19,588	456	142	17	15	6.5
MARYLAND							
Baltimore	940,205	6,930,877	13,889	5,954	1,150	1,066	6.3
Cumberland	37,632	.....	449	193	35	10	5.1
Hagerstown	36,232	61,375	504	296	60	18	8.2
Montgomery County	163,749	562,711	1,622	676	192	38	4.1
MASSACHUSETTS							
Arlington	43,984	57,817	946	65	61	61	1.5
Attleboro	23,665	145,454c	579	123	31	14	5.2
Belmont	27,379	17,194	629	158	45	33	5.8
Beverly	28,855	87,484	1,059	294	71	17	10.2
Boston	790,863	3,250,177a	17,202	3,971	898	2,485	5.0
Braintree	23,130	26,287	796	141	75	35	6.1
Brockton	62,856	140,000a	1,622	441	96	104	7.0
Brookline	56,952	324,088c	1,148	334	66	56	5.9
Cambridge	120,676	304,176c	4,476	467	157	348	3.9
Chelsea	39,038	91,928	1,444	317	58	110	8.1
Chicopee	48,939	212,715	750	121	54	25	2.5
Everett	45,789	42,602c	900	144	68	59	3.1
Fall River	111,759	836,982c	1,437	416	105	156	3.7
Fitchburg	42,671	87,890	935	180	60	55	4.2
Framingham	27,845	.....	.....	.....	.....	.....	.....
Gloucester	25,048	149,256	771	217	25	31	8.7
Haverhill	47,213	279,689	1,502	.....	.....	81	.....
Holyoke	54,441	.....	.....	.....	.....	.....	.....
Lawrence	80,427	190,000a	1,909	269	89	100	3.4
Leominster (f)	24,084	56,782	519	86	17	16	3.6
Lowell	96,523	248,908c	2,094	526	147	93	5.5
Lynn	99,521	520,074c	2,693	827	130	210	8.3
Malden	59,779	356,468a	1,316	119	59	51	2.0
Medford	66,109	122,500	394	132	18	134	2.0
Melrose	26,919	28,946c	764	18	47	11	0.7

a. Estimated. b. Incomplete. c. Building and contents only. e. Subject to change. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
MASSACHUSETTS (Continued)							
Methuen	24,411	66,955	809	112	19	25	4.6
Milton	22,395	65,200	790	94	44	68	4.2
New Bedford	109,033	161,781	1,352	335	92	82	3.1
Newton	80,996	184,673	1,840	251	54	82	3.1
North Adams	21,475	134,456	497	171	90	10	8.0
Northampton	28,998	39,786	414	162	32	17	5.6
Peabody	22,647	.....	.....	.....	.....	.....	.....
Pittsfield	53,055	105,041b	871	243	68	26	4.6
Quincy	83,190	363,522a	2,496	408	135	128	4.9
Revere	36,663	145,773	1,384	82	.....	166	2.2
Salem	41,842	49,049c	973	231	101	21	5.5
Somerville	102,254	436,267	1,773	536	134	229	5.3
Springfield	162,601	446,694	3,455	633	174	319	3.9
Taunton	40,056	59,264	803	185	44	45	4.6
Waltham	47,198	123,072	1,014	213	67	60	4.5
Watertown	37,339	38,789	1,229	161	.....	71	4.3
Wellesley	20,847	116,924b	563	52	32	22	2.5
Westfield	20,961	40,849	363	100	29	8	4.8
West Springfield	20,398	77,526	494	64	44	18	3.1
Weymouth	32,695	112,005	953	72	57	15	2.2
Woburn (f)	20,269	184,676	1,041	47	39	76	2.3
Worcester	201,885	1,200,000a, c	4,633	945	191	615	4.7
MICHIGAN							
Ann Arbor	47,279	108,692c	491	71	59	7	1.5
Battle Creek	48,469	290,744	833	204	81	56	4.2
Bay City	52,372	248,165	726	208	78	19	4.0
Dearborn	94,529	707,758	1,360	252	110	146	2.7
Detroit	1,838,517	6,564,463c	19,014	6,252	1,738	2,175	3.4
East Detroit	21,373	48,376	256	80	31	3	3.8
East Lansing	20,310	24,161	228	10	8	6	0.5
Ferndale	29,670	283,190	396	119	43	41	4.0
Flint	162,800	581,785c	2,193	665	241	152	4.1
Grand Rapids	175,647	684,694	1,603	295	99	87	1.7
Hamtramck	43,245	229,545	737	348	54	79	8.1
Highland Park	46,155	377,424c	758	268	90	30	5.8
Jackson	50,904	56,937c	1,178	245	85	61	4.8
Kalamazoo	51,326	78,612a, c	678	173	67	26	3.4
Lansing	91,694	165,801c	2,691	309	160	72	3.4
Lincoln Park	29,265	38,894	603	106	64	79	3.6
Monroe	21,275	25,937	294	77	39	12	3.6
Muskegon	48,047	.....	.....	.....	.....	.....	.....
Pontiac	73,112	205,205	1,467	372	82	129	5.1
Port Huron	35,297	140,881	568	199	57	27	5.6
River Rouge	20,366	32,481	273	104	40	12	5.1
Royal Oak	46,817	333,150	761	230	63	63	4.9
Saginaw	92,352	655,965c	1,495	248	114	46	2.7
Wyandotte	36,666	66,265	544	160	57	91	4.4
MINNESOTA							
Austin	23,035	145,387c	258	122	20	2	5.3
Duluth	104,066	524,985	1,463	235	72	56	2.3
Minneapolis	517,277	3,116,463	5,433	1,152	423	304	2.2
Rochester	29,634	298,518	483	179	33	69	6.0
St. Cloud	22,744	14,846	284	85	25	3	3.7
St. Louis Park	22,495	38,955	491	136	24	5	6.1
St. Paul	309,474	1,188,282c	4,769	738	338	357	2.4
Winona	24,965	49,539	354	162	24	8	6.5

a. Estimated. b. Incomplete. c. Building and contents only. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
MISSISSIPPI							
Biloxi	37,034	122,844	309	79	34	12	2.1
Greenville	29,914	28,175c	542	197	64	33	6.6
Gulfport	22,428	.....	443	115	45	10	5.1
Hattiesburg	29,432	61,953	539	157	40	9	5.3
Jackson	97,674	223,960	1,173	400	84	56	4.1
Laurel	24,988	83,309	414	120	36	8	4.8
Meridian	41,709	85,542	572	214	66	37	5.1
Natchez	22,678	.....	813	102	144	.....	4.5
Vicksburg	27,344	108,338	516	69	20	13	2.5
MISSOURI							
Cape Girardeau	21,539	212,240	417	148	29	11	6.9
Columbia	31,731	82,719	370	159	29	10	5.0
Hannibal	20,486	23,356	289	107	71	5	5.2
Independence	36,832	84,135	619	168	77	15	4.6
Jefferson City	24,990	52,700c	328	69	39	12	2.8
Joplin	37,188	371,757c	970	386	90	23	10.4
Kansas City	439,646	2,706,387	6,618	2,082	634	559	4.8
St. Joseph	75,572	282,042c	1,464	469	143	75	6.2
St. Louis	852,623	.....	.....	.....	.....	.....	.....
Sedalia	20,269	48,645	300	131	35	2	6.5
Springfield	66,302	.....	.....	.....	.....	.....	.....
University City	39,595	47,667	1,096	89	33	12	2.3
Webster Groves	23,289	32,025c	308	52	41	0	2.2
MONTANA							
Billings	31,725	29,874	457	61	20	40	1.9
Butte	32,904	37,000	705	144	37	275	4.4
Great Falls	39,006	105,837	483	166	31	39	4.3
Missoula	22,320	112,541	298	173	20	14	7.8
NEBRASKA							
Grand Island	22,835	37,294	225	86	34	.....	3.8
Hastings	20,108	130,327	287	92	27	5	4.6
Lincoln	97,423	360,924a	1,245	367	144	19	3.8
Omaha	247,408	817,025	2,907	1,812	355	80	7.3
NEVADA							
Las Vegas	24,418	255,071	844	272	103	59	11.1
Reno	32,225	450,414	1,244	373	52	10	11.6
NEW HAMPSHIRE							
Concord	27,984	33,319c	704	237	115	12	8.5
Manchester	82,581	698,085c	1,267	239	67	35	2.9
Nashua	34,666	57,783c	532	223	130	9	6.6
NEW JERSEY							
Atlantic City	61,642	950,583	808	443	88	84	7.2
Bayonne	76,657	.....	960	227	69	99	3.0
Belleville	32,059	32,065	585	113	74	44	3.5
Bloomfield	49,313	177,858	837	203	46	44	4.1
Camden	125,546	858,152	1,818	418	150	178	3.3
Clifton	64,567	209,486	1,026	109	79	59	1.7
East Orange	78,057	77,125c	918	277	68	77	3.6
Elizabeth (f)	112,675	784,460	1,158	387	135	97	3.4
Englewood	23,092	.....	.....	.....	.....	.....	.....
Fair Lawn	23,865	.....	.....	.....	.....	.....	.....
Garfield	27,605	.....	.....	.....	.....	.....	.....
Hackensack	29,207	56,940c	588	104	34	19	3.6
Hillside	21,000	421,087	415	138	36	1	6.6

a. Estimated. c. Building and contents only. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
NEW JERSEY (Continued)							
Hoboken	50,510	.....	1,001	323	39	70	6.4
Irvington	59,142	117,892	1,402	214	49	27	3.6
Jersey City	300,447	1,340,434	3,620	1,288	211	383	4.3
Kearny	39,828	160,000	542	87	42	41	2.2
Linden	30,434	84,493	752	184	89	49	6.1
Long Branch	23,094	.....	.....	.....	.....	.....	.....
Maplewood	25,000	127,835	241	84	19	28	3.4
Montclair	43,775	121,075	580	172	63	28	3.9
Newark	437,857	3,415,164	6,240	2,552	737	803	5.8
New Brunswick	38,768	487,688	608	162	53	38	4.2
North Bergen Twp.	39,714	120,000c	876	87	56	25	2.2
Nutley	26,746	62,759	537	80	30	35	3.0
Orange	38,413	291,789	502	208	47	41	5.4
Passaic	57,851	290,889	696	249	55	68	4.3
Paterson	139,423	885,219c	1,837	919	228	112	6.6
Perth Amboy	41,291	264,275	297	114	54	11	2.8
Plainfield	42,212	294,501c	632	182	47	29	4.3
Rahway	21,287	15,765	480	161	25	15	7.6
Teaneck Twp.	34,000	55,832	705	100	34	11	2.9
Trenton	127,867	480,718	1,389	544	160	129	4.3
Union City	55,322	208,099c	929	231	65	37	4.2
Union Twp.	39,000	174,919	583	191	60	0	4.9
West New York	37,754	44,097c	642	100	37	29	2.7
Westfield	21,335	.....	957	104	16	4	4.9
West Orange	28,624	53,000a	428	129	50	33	4.5
NEW MEXICO							
Albuquerque	97,000	.....	.....	.....	.....	.....	.....
Roswell	25,572	76,568	350	128	59	4	5.0
Santa Fe (f)	29,750	76,320	185	65	20	14	2.2
NEW YORK							
Albany	134,382	481,387c	3,939	426	121	297	3.2
Amsterdam	32,269	149,466c	316	108	29	8	3.4
Auburn	36,667	131,270	420	178	34	23	4.9
Binghamton	81,132	380,756	704	158	62	.....	1.9
Buffalo (f)	477,393	2,521,946	3,886	1,257	326	265	2.7
Cohoes	21,235	6,889	346	77	20	10	3.6
Elmira	49,690	125,724c	401	258	37	27	5.2
Endicott	20,168	160,345c	209	61	14	7	3.0
Freeport	24,589	.....	.....	.....	.....	.....	.....
Gloversville	23,576	84,016c	244	43	16	9	1.8
Hempstead	29,021	.....	.....	.....	.....	.....	.....
Irondequoit Twp.	34,045	.....	.....	.....	.....	.....	.....
Ithaca	29,395	244,610	214	52	49	1	1.8
Jamestown	43,250	.....	.....	.....	.....	.....	.....
Kenmore	20,332	10,397	98	28	11	8	1.4
Kingston	28,860	60,519	495	160	53	34	5.6
Lackawanna	27,646	125,835	365	75	6	45	2.7
Lockport	25,136	73,655	482	139	39	46	5.5
Middletown	22,565	46,123	244	35	27	14	1.6
Mount Vernon	71,837	299,578	1,078	253	44	47	3.5
Newburgh	31,924	50,239	317	151	41	11	4.7
New Rochelle	59,626	151,892	780	296	62	26	5.0
New York	7,835,099	.....	75,033	24,000	5,160	15,045	3.1
Niagara Falls	90,875	130,138	1,133	296	67	104	3.3
North Tonawanda	24,730	134,727	391	101	25	18	4.1
Olean	22,842	25,245	308	39	.....	59	1.7
Oswego	22,611	44,758c	268	104	7	8	4.6

a. Estimated. c. Building and contents only. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
NEW YORK (Continued)							
Port Chester	23,969	317,900c	397	244	33	17	10.2
Poughkeepsie	40,975	81,061	462	197	44	36	4.8
Rochester	331,252	719,519c	3,679	933	179	186	2.8
Rockville Centre (f)	22,274	138,743	181	31	13	10	1.4
Rome	41,379	87,521c	486	103	40	23	2.5
Schenectady	92,070	268,562c	1,143	325	93	79	3.5
Syracuse	220,067	1,986,920	1,857	756	189	230	3.4
Troy	71,659	198,698c	1,460	449	88	37	6.3
Utica	101,479	325,757c	1,006	243	84	42	2.4
Valley Stream	26,833	.....	.....	.....	.....	.....	.....
Watertown	34,280	60,162c	441	168	40	52	4.9
White Plains	43,501	65,308c	593	189	73	42	4.3
Yonkers	152,533	326,228	2,248	548	120	124	3.6
NORTH CAROLINA							
Asheville	52,208	137,892c	853	62	54	63	1.2
Burlington	24,495	50,167	473	76	48	14	3.1
Charlotte	133,219	650,397	2,750	835	158	454	6.3
Durham	70,307	202,925c	867	499	97	53	7.1
Fayetteville	34,605	96,011	771	197	67	79	5.7
Gastonia	23,003	116,000	433	217	42	24	9.4
Goldsboro	21,399	301,202	494	203	39	13	9.5
Greensboro	73,703	504,849	1,077	380	98	77	5.2
High Point	39,930	120,031c	699	336	61	66	8.4
Raleigh	65,123	.....	.....	.....	.....	.....	.....
Rocky Mount	27,644	60,073c	407	87	54	15	3.1
Wilmington	44,925	.....	.....	.....	.....	.....	.....
Wilson	22,964	19,950	347	158	34	23	6.9
Winston-Salem	86,816	225,633	1,200	192	111	69	2.2
NORTH DAKOTA							
Fargo	37,981	89,614	511	.....	.....	13	.....
Grand Forks	26,617	85,896	241	146	30	18	5.5
Minot	21,924	15,874	219	34	22	4	1.6
OHIO							
Akron	273,189	1,000,568	3,029	656	260	326	2.4
Alliance	26,112	133,275	308	85	36	17	3.3
Ashtabula	23,093	191,142	392	86	24	6	3.7
Barberton	27,893	88,853	412	96	31	35	3.4
Canton	116,312	356,449	1,187	248	130	108	2.1
Chillicothe	20,121	175,036	409	103	62	14	5.1
Cincinnati	500,510	1,275,335	6,421	2,071	641	389	4.1
Cleveland	905,636	6,788,220a, c	10,981	2,610	734	966	2.9
Cleveland Heights	58,782	252,410	1,074	224	43	8	3.8
Columbus	374,770	635,148	6,849	1,123	348	190	3.0
Cuyahoga Falls	29,076	54,429c	485	58	31	33	2.0
Dayton	243,108	323,685	3,713	632	277	297	2.6
East Cleveland	39,875	26,825	548	87	42	26	2.2
East Liverpool	24,072	201,392	618	250	45	9	10.4
Elyria	30,197	64,847	293	101	39	2	3.4
Euclid	41,447	20,337	612	140	36	25	3.4
Findlay	23,806	81,776c	398	119	44	4	5.0
Garfield Heights	21,606	.....	.....	.....	.....	.....	.....
Hamilton	57,717	274,731	1,381	251	83	71	4.4
Lakewood	67,878	40,481	362	85	35	73	1.3
Lancaster	24,140	72,734	1,043	116	53	16	4.8
Lima	49,880	228,058	683	305	89	29	6.1
Lorain	50,819	168,775	667	144	53	51	2.8

a. Estimated. c. Building and contents only. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
OHIO (Continued)							
Mansfield	43,363	88,642	663	252	104	28	5.8
Marion	33,786	356,269	526	118	65	16	3.5
Massillon	29,524	12,389	578	133	40	27	4.5
Middletown	33,634	114,976	503	155	60	48	4.6
Newark	34,178	112,547	770	103	78	44	3.0
Norwood	34,626	68,033	273	102	43	9	2.9
Parma	28,852	87,850	726	67	23	8	2.3
Portsmouth	36,663	127,554	474	180	94	40	4.9
Sandusky	29,060	61,653	567	140	34	14	4.8
Shaker Heights	27,980	103,370	545	274	40	8	9.8
Springfield	78,029	461,759	1,111	411	151	54	5.3
Steubenville	35,695	62,210	438	145	45	70	4.1
Toledo	301,358	905,256	3,070	1,062	358	300	3.5
Warren	49,674	205,539	572	109	94	27	2.2
Youngstown	167,643	214,793	1,849	401	145	163	2.4
Zanesville	40,424	78,676	430	206	47	.....	5.1
OKLAHOMA							
Enid	35,976	70,669	531	170	64	26	4.7
Lawton	34,527	87,215	677	248	63	3	7.2
Muskogee	37,255	93,406c	643	128	50	31	3.4
Norman	26,972	17,389	391	70	20	0	2.6
Oklahoma City	242,450	745,034c	3,656	996	.....	191	4.1
Ponca City	20,185	51,878	352	92	23	6	4.6
Shawnee	24,457	202,504c	378	130	26	7	5.3
Stillwater	20,155	21,924	292	66	27	5	3.3
Tulsa	180,586	521,958	1,071	805	192	155	4.5
OREGON							
Eugene	35,672	187,740c	598	563	35	19	15.8
Portland	371,011	706,413	4,895	2,798	326	284	7.5
Salem	43,064	97,738	484	379	20	11	8.8
PENNSYLVANIA							
Aliquippa	26,067	10,785c	207	93	17	15	3.6
Allentown	106,233	255,914c	374	157	68	30	1.5
Altoona	76,844	31,750	797	128	56	82	1.7
Bethlehem	66,027	172,439c	307	114	54	11	1.7
Butler	23,511	33,450c	280	97	47	3	4.1
Cheltenham Twp.	23,000	85,325	228	51	23	4	2.2
Chester	65,824	101,289	655	267	53	28	4.1
Dunmore	20,302	13,750	129	12	11	9	0.6
Easton	34,410	202,191c	209	62	38	9	1.8
Erie	130,125	183,537	1,853	438	104	27	3.4
Harrisburg	89,091	200,000e	577	311	74	44	3.5
Haverford Twp.	40,000	.....	.....	.....	.....	.....	.....
Hazleton	35,486	.....	.....	.....	.....	.....	.....
Johnstown	62,723	48,021	828	240	61	58	3.8
Kingston	21,061	21,275c	123	18	8	7	0.9
Lancaster	63,601	272,588	340	.....	44	38	.....
Lebanon	28,134	.....	.....	.....	.....	.....	.....
Lower Merion Twp.	49,000	226,650	593	179	75	7	3.7
McKeesport	51,223	.....	.....	.....	.....	.....	.....
Mount Lebanon Twp.	26,604	13,505	204	89	10	2	3.3
Nanticoke	20,140	17,345	87	24	14	6	1.2
New Castle	48,563	81,880	526	235	65	42	4.8
New Kensington (f)	25,226	69,910c	121	28	12	16	1.1
Norristown	38,143	10,297c	162	106	12	17	2.8
Philadelphia	2,064,794	13,054,709a, c	25,904	6,767	1,788	3,229	3.3

a. Estimated. c. Building and contents only. e. Subject to change. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
PENNSYLVANIA (Continued)							
Pittsburgh	673,763	1,070,000a	5,973	3,324	509	980	4.9
Pottstown	22,616	47,327c	174	77	25	2	3.4
Pottsville	23,642	182,318	138	54	10	4	2.3
Reading	109,062	.....	.....	.....	.....	.....	.....
Scranton	124,305	489,000a, c	1,365	309	112	117	2.5
Sharon	26,305	44,000c	288	93	58	7	3.5
Uniontown	20,423	.....	.....	.....	.....	.....	.....
Upper Darby Twp.	186,000	144,716	518	187	32	5	1.0
Washington	25,898	35,048	255	124	49	18	4.8
Wilkes-Barre	76,638	344,815	686	185	44	50	2.4
Wilkinsburg	31,281	32,212	185	131	19	14	4.2
Williamsport	44,946	244,883c	483	245	38	20	5.5
York	59,704	1,231,917c	312	151	45	42	2.5
RHODE ISLAND							
Central Falls	23,610	30,459	200	36	30	10	1.5
Cranston	55,130	179,992c	1,206	147	53	31	2.7
East Providence	35,791	86,693	870	140	42	63	3.9
Newport	32,090	86,074c	371	216	24	19	6.8
Pawtucket	81,180	493,021	1,476	260	109	160	3.2
Providence	274,700	1,143,788c	4,550	399	340	422	1.5
Warwick Twp.	43,027	.....	.....	.....	.....	.....	.....
Woonsocket	50,186	.....	.....	.....	.....	.....	.....
SOUTH CAROLINA							
Charleston	68,243	173,017c	950	495	49	211	7.3
Columbia	85,949	625,892c	1,187	647	159	70	7.5
Greenville	57,932	361,534	954	399	157	78	6.9
Spartanburg	36,674	56,357	640	139	77	98	3.8
SOUTH DAKOTA							
Rapid City (f)	25,179	25,173	375	38	26	0	1.5
Sioux Falls	52,161	520,784	447	116	35	10	2.2
TENNESSEE							
Chattanooga	130,333	377,252	2,131	710	137	122	5.5
Jackson	30,098	67,143	434	227	54	3	7.6
Johnson City	27,778	40,970	424	157	45	5	5.7
Knoxville	124,183	113,769	3,000	749	168	157	6.0
Memphis	394,012	1,231,380	6,244	1,946	477	144	4.9
Nashville	173,359	824,266	3,238	1,070	276	160	6.2
TEXAS							
Abilene	47,102	189,855a, c	628	242	73	27	5.1
Amarillo	73,737	245,870	815	121	.....	111	1.6
Austin	131,964	616,944c	1,773	365	147	34	2.8
Baytown	22,927	55,529c	208	97	24	3	4.2
Beaumont	93,715	174,500a	1,394	633	136	95	6.8
Brownsville	36,176	41,955b	358	97	21	19	4.2
Brownwood	20,140	50,000	295	.....	29	96	.....
Corpus Christi	108,053	275,744	1,232	387	117	86	3.6
Dallas	432,927	3,793,251a	7,713	1,357	758	269	3.1
Denton	21,345	84,000d	256	95	60	4	4.5
El Paso	130,000	120,000c	1,547	467	79	127	3.6
Fort Worth	277,047	2,482,365	4,211	545	449	678	2.0
Galveston	65,898	140,223c	1,055	299	88	258	4.5
Harlingen	23,202	160,560c	302	99	39	0	4.3
Houston	594,321	3,988,672c	6,896	2,559	601	764	4.3
Laredo	51,694	17,818	334	85	31	11	1.6

a. Estimated. b. Incomplete. c. Building and contents only. d. Insured loss only.
f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
TEXAS (Continued)							
Longview	24,445	156,758c	561	159	39	3	6.5
Lubbock	71,390	298,000a	1,294	460	117	47	6.4
Marshall	22,255	178,448c	434	88	41	8	4.0
McAllen	20,005	.....	132	60	31	10	3.0
Midland	21,756	233,699c	409	215	41	20	9.9
Odessa	29,432	151,632c	510	227	64	29	7.7
Orange	21,100	42,102c	268	74	27	42	3.5
Paris	21,636	212,541c	415	150	33	3	7.0
Pasadena (f)	22,444	55,066	208	69	14	0	3.1
Port Arthur	57,377	187,905c	492	50	48	61	0.9
San Angelo	51,889	150,943c	545	283	72	35	5.5
San Antonio	406,811	904,574	4,481	1,384	441	249	3.4
Sherman	20,013	70,000a	265	72	30	30	3.6
Temple	24,970	.....	.....	.....	.....	.....	.....
Texarkana	24,657	147,867a	.....	107	.....	.....	4.3
Tyler	38,864	94,262	582	212	67	41	5.5
University Park	23,823	65,851c	181	34	20	0	1.4
Waco	84,300	245,040b, c	812	422	125	18	5.0
Wichita Falls	67,709	271,343c	1,285	379	98	101	5.6
UTAH							
Ogden	56,910	101,324	1,298	194	64	29	3.4
Provo City	28,901	36,370	281	86	19	0	3.0
Salt Lake City	181,718	272,766	2,358	656	114	119	3.6
VERMONT							
Burlington	33,039	.....	650	254	35	39	7.6
VIRGINIA							
Alexandria	61,604	611,334	1,024	418	102	12	6.8
Arlington County	134,990	.....	.....	.....	.....	.....	.....
Charlottesville	25,909	193,127c	290	92	44	15	3.6
Danville	34,537	43,997a	548	236	66	21	6.8
Hampton	60,994	.....	.....	.....	.....	.....	.....
Lynchburg	47,639	171,713	769	261	55	46	5.5
Newport News	41,571	63,987	725	331	49	77	8.0
Norfolk	188,601	744,562	3,562	968	197	411	5.1
Petersburg	34,948	45,569	854	367	74	65	10.5
Portsmouth	71,294	338,868	1,269	333	65	130	4.7
Richmond	229,906	778,185	3,761	2,227	407	286	9.7
Roanoke	91,089	428,062c	1,356	524	.....	88	5.8
Warwick	39,875	57,660	520	226	54	28	5.7
WASHINGTON							
Bellingham	33,934	.....	.....	.....	.....	.....	.....
Bremerton	27,746	35,622	431	258	40	25	9.3
Everett	33,807	67,894	691	134	37	26	4.0
Longview	20,556	17,815c	217	134	11	25	6.5
Seattle	462,985	567,094	4,907	1,650	380	243	3.6
Spokane	160,484	504,611c	2,086	924	121	132	5.8
Tacoma	142,975	612,196	2,200	1,105	124	116	7.7
Vancouver	27,977	140,053	515	50	35	17	1.8
Walla Walla	24,071	627,538c	443	114	29	35	4.8
Yakima	38,375	51,389c	653	311	53	16	8.1
WEST VIRGINIA							
Bluefield	21,341	78,535	224	58	8	7	2.7
Charleston	72,818	149,192	982	282	103	147	3.9
Clarksburg	31,817	.....	.....	.....	.....	.....	.....
Fairmont	29,273	13,300	175	58	27	4	2.0

a. Estimated. b. Incomplete. c. Building and contents only. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
WEST VIRGINIA (Continued)							
Huntington	86,160	.....	.....	.....	.....	.....	.....
Morgantown	25,443	24,465	357	130	7	3	5.1
Parkersburg	40,492	79,485c	345	92	35	18	2.3
Weirton	24,143	59,432	224	51	26	2	2.1
Wheeling	58,447	94,230	1,417	189	86	18	3.2
WISCONSIN							
Appleton	33,892	79,079	620	336	38	36	10.0
Beloit	29,541	377,757	562	275	39	17	9.3
Eau Claire	35,862	104,798	530	176	39	36	4.9
Fond du Lac	29,826	62,483	335	171	35	26	5.7
Green Bay	52,443	587,021	936	250	54	56	4.8
Janesville	24,829	73,976	586	203	27	27	8.2
Kenosha	54,360	189,348	967	288	55	13	5.3
La Crosse	47,396	129,746	684	345	57	20	7.3
Madison	95,594	193,975e	903	329	73	33	3.4
Manitowoc	27,444	136,811	449	129	31	23	4.7
Milwaukee	632,651	2,489,066	9,565	1,603	501	357	2.5
Oshkosh	40,934	114,299a	619	220	49	24	5.4
Racine	70,749	101,532	1,801	227	49	49	3.2
Sheboygan	42,485	29,316	482	235	34	18	5.5
Superior	35,091	68,225	711	312	32	15	8.9
Waukesha	21,186	38,773	322	130	22	1	6.2
Wausau	30,386	127,257	544	174	22	19	5.7
Wauwatosa	33,300	59,482	429	98	15	9	2.9
West Allis	42,945	368,905	668	.....	.....	16	.....
WYOMING							
Casper	33,557	18,218	242	96	14	10	2.9
Cheyenne	31,807	80,880	447	125	29	22	3.9

1953 FIRE LOSSES, CANADIAN CITIES

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
ALBERTA							
Calgary	133,000	500,906	1,349	741	96	203	5.5
Edmonton	158,912	264,238c	1,419	400	72	241	2.5
Lethbridge	23,000	124,331	330	79	18	10	3.4
BRITISH COLUMBIA							
Burnaby	60,000	108,906	510	98	37	8	1.6
New Westminster	30,000	51,734	323	51	27	39	1.7
Saanich	24,000	25,583	394	128	20	0	5.3
Vancouver (f.)	385,500	2,087,833	4,924	2,343	203	76	6.1
Victoria	50,774	93,647	785	449	48	60	8.9
MANITOBA							
Brandon	21,214	277,540	263	156	13	19	7.4
St. Boniface	26,214	137,680c	365	208	41	36	7.9
Winnipeg	229,045	.....	.....	.....	.....	.....	.....
NEW BRUNSWICK							
Moncton	30,000	.....	.....	.....	.....	.....	.....
Saint John	63,000	316,733a	1,310	717	61	75	11.4
NOVA SCOTIA							
Glace Bay	28,000	141,903c	112	56	10	8	2.0
Halifax	122,656	548,146*	1,402	889	58	118	7.3
Sydney	28,305	.....	.....	.....	.....	.....	.....

*One fire accounted for 76% of total loss.

a. Estimated. c. Building and contents only. e. Subject to change. f. Not included in totals.

City	Population (Last Census)	Total Loss 1953	No. Alarms 1953	No. Bldg. Fires 1953	No. Auto Fires 1953	No. Malicious False Alarms 1953	Bldg. Fires Per 1000 Population
ONTARIO							
Brantford	36,602	30,050	510	104	38	13	2.8
Chatham	22,000	47,201c	208	106	22	13	4.8
East York Twp.	67,000	31,840c	230	57	31	10	0.9
Etobicoke	46,000	124,000	451	230	46	10	5.0
Fort William	30,585	98,716	572	358	12	.....	11.7
Galt	23,085	21,884	290	125	30	9	5.4
Guelph	25,962	88,195c	430	290	33	2	11.2
Hamilton	196,246	1,088,438	2,430	643	184	170	3.3
Kingston	36,000	281,380	685	344	57	49	9.6
Kitchener	43,084	26,393	266	63	22	0	1.5
London	94,027	335,042c	969	207	.....	45	2.2
Niagara Falls	20,589	20,447	194	42	34	18	2.0
North York Twp.	62,646	90,857a	779	244	61	38	3.9
Oshawa	40,727	451,513	470	363	10	18	8.9
Ottawa	220,026	354,221a	2,338	1,204	165	143	5.5
Peterboro	35,065	169,654c	643	69	26	22	2.0
Port Arthur	32,000	47,079	660	78	30	38	2.4
St. Catharines	37,988	126,183c	449	266	36	12	7.0
Sarnia	35,000	120,096	395	191	38	25	5.5
Sault Ste. Marie	33,000	84,220	411	227	49	28	6.9
Scarboro Twp.	60,000	159,065	824	195	42	62	3.2
Sudbury	50,222	49,415	487	96	27	.....	1.9
Timmins	26,385	34,670	641	71	26	25	2.7
Toronto	666,467	2,806,907a	6,190	4,330	531	.....	6.5
Windsor	121,011	480,000a	1,236	515	109	149	4.3
York Twp.	98,000	132,384	674	139	48	30	1.4
QUEBEC							
Chicoutimi	21,337	127,945	251	146	6	15	6.8
Hull	43,871	379,349c	.....	.....	.....	77	.....
Jonquiere	25,765	.....	475	66	9	67	2.6
Lachine	29,625	188,501	302	86	19	36	2.9
Montreal	1,181,955	7,621,173	11,960	2,269	550	2,963	1.9
Outremont	32,000	95,324	.....	239	.....	.....	7.5
Quebec	205,115	2,483,226	2,810	565	87	618	2.8
Shawinigan Falls	38,000	19,080	303	53	18	28	1.4
Sherbrooke	52,000	58,506c	730	424	35	59	8.1
Three Rivers	53,000	207,022	536	318	23	80	6.0
Verdun	79,050	134,041	866	339	19	114	4.3
Westmount	27,203	52,254	293	78	20	49	2.9
SASKATCHEWAN							
Moose Jaw	25,000	35,883	446	51	11	42	2.0
Regina	69,995	216,807	868	301	32	150	4.3
Saskatoon	53,000	110,101	735	400	33	109	7.5

a. Estimated. c. Building and contents only.

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1953 RECORD OF PERFORMANCE

Figures for the Past Year Furnish Proof of Continued ADT Protection Efficiency

The accompanying statistical analysis of ADT performance during 1953 and for the past ten years furnishes impressive evidence of the efficacy of ADT Central Station Protection Services in establishing a high degree of immunity from fire and burglary losses.

Performance of this type can be obtained only through continuous supervision and proper maintenance of protective signaling systems as supplied by ADT Central Station Services. May we tell you how ADT Services can give you better protection at lower cost by safeguarding your property *automatically*.

Call our Commercial Department if we are listed in your phone book; or write to our Executive Offices.

SPRINKLER SUPERVISORY AND WATERFLOW ALARM SERVICE

Supervisory alarms, indicating temporary impairment of sprinkler systems	189,268
Waterflow alarms, caused by fires or serious leaks	2,708
Manual fire alarms	157
Reported values of properties protected	$13,088,723,000
Ratio of losses to values protected	2/100th of 1%
Fire loss immunity in 1953	$99\frac{98}{100}\%$
AVERAGE FIRE LOSS IMMUNITY DURING THE PAST TEN YEARS	$99\frac{97}{100}\%$

WATCHMAN'S REPORTING AND MANUAL FIRE ALARM SERVICE

Investigations of failures of watchmen to signal Central Station on schedule	228,584
Total number of signals recorded	325,178,392
Watchmen's patrol efficiency	99 93/100ths%
Alarms from Manual Fire Alarm Boxes	1,362
Reported values of properties protected	$18,907,278,000
Ratio of losses to values protected	2/100ths of 1%
Fire loss immunity in 1953	$99\frac{98}{100}\%$
AVERAGE FIRE LOSS IMMUNITY DURING THE PAST TEN YEARS	$99\frac{96}{100}\%$

ADT

Controlled Companies of
AMERICAN DISTRICT TELEGRAPH COMPANY
A NATIONWIDE ORGANIZATION
Executive Offices
155 SIXTH AVENUE • NEW YORK 13 • N. Y.

We engineer, design and manufacture:

Interior Fire Alarm Signaling Systems.

Automatic Heat Actuated Fire Alarm Signaling Systems.

Standpipe Fire Line Control and Signaling Systems.

Central Office Systems for Manual Fire, Automatic Heat Actuated Fire Alarm Systems, Sprinkler Alarm and Supervision, Watch Patrol Recording and Kindred Systems.

Supervisory Systems for Detecting Excessive Heat, Pressure and Low Voltage in Transformer Sub-stations and to Automatically Disconnect the Sub-stations from the Line and Load Sides of the Systems.

Local Sprinkler Alarm and Supervisory Systems.

Smoke and Heat Detecting Systems for Air Conditioning Systems.

Sprinkler Waterflow Detectors.

120 Volt A.C. Vibrating Bells.

Emergency Switches to Shut Down Fuel Oil Systems, Ammonia Compressors and Air Conditioning Systems.

Ground Detector Systems for Hospital Operating Rooms.

ACME FIRE ALARM CO., Inc.

106 SEVENTH AVE., NEW YORK CITY, N. Y.

DETECT-A-FIRE®

Rate Compensation Actuated THERMOSTATS insure positive Fire Detection for alarm or release systems

Fenwal DETECT-A-FIRE units are based on an entirely new principle. The outer shell is the sensing element — reacting to the temperature of the air around it. The contacts function when surrounding air reaches a danger level.

- *Hermetic Sealing* of internal electrical components.
- *Stainless Steel Construction* — for corrosion resistance and long life.
- *Temperature Setting Range*, 140 F to 725 F.
- *Long Spacing* . . . 25 feet . . . economy of installation.
- *Repeatable.* Unit re-sets itself, nothing to replace.
- *Shock and Vibration Resistant* . . . rugged construction.

SERIES 70 HORIZONTAL MODEL.

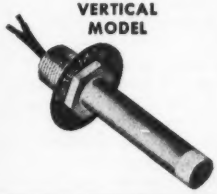
For locations where appearance is a factor. Suitable for all commercial, industrial, mercantile and public buildings, institutions and ships, in locations classified as "ordinary" under the National Electric Code.

TYPES 7020 and 7021

Flush Mounting Unit for new construction and concealed wiring. Type 7020, normally closed circuits; Type 7021, normally open circuits. Designed to fit standard 4" junction boxes. For exposed wiring, Types 7020-1 and 7021-1 with surface adapter ring.

LISTING and APPROVALS: Ⓤ, ◈, USCG, and American Bureau of Shipping Acceptance.

SERIES 71 VERTICAL MODEL



For ordinary and hazardous locations i.e., Class I, Groups C and D; Class II, Groups E, F, and G. Explosion-proof in itself. For hazardous locations, mount to Crouse Hinds CPS 021 Cover or Appleton BFGS Hub Cover for explosion-proof system.

TYPES 7120 and 7121

For concealed and exposed wiring. Type 7120, normally closed circuits. Type 7121, normally open circuits.

LISTING and APPROVALS: Ⓤ, ◈, and American Bureau of Shipping Acceptance.

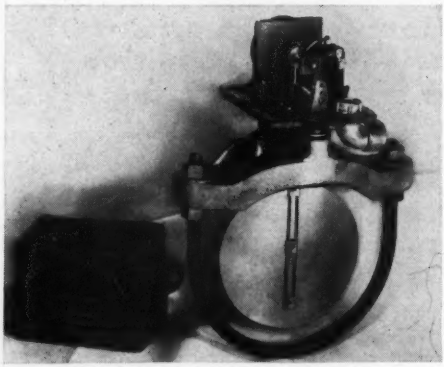
SEND FOR THESE BULLETINS.

They give the latest authoritative data on fire or overheat detection. They discuss in full the rate compensation principle; give exact engineering data. Write for Bulletins MC-107A and MC-108 to Fenwal Incorporated, 144 Pleasant Street, Ashland, Mass.

Fenwal

DETECT-A-FIRE® Thermostats

DYNAMIC, RATE COMPENSATION ACTUATED FIRE DETECTORS



5-inch size shown above. To install simply drill 2-inch hole in pipe.

Model PRS-1

Sprinkler

Waterflow Alarm

This device is approved by Factory Mutual Laboratories and Underwriters' Laboratories, Inc.

- This device is also made as Model PRT-1, a coded waterflow transmitter.

- Also made in explosion proof models.
- Made in all sizes from 2½" to 8".
- Has instantly recycling pneumatic retarding device, which prevents false alarms.
- Has enclosed electrical contacts for 15 amp. 125 volts, A.C. and ½ AMP, 125 volts, D.C.

Size is 1⅝" x ⅝"

Tempo-Set Model A

Fire Detector

Underwriters' Laboratories, Inc. Approved.

- Self restoring and can be heat tested.
- Electrical contacts are silver or gold and are enclosed.
- Very reasonable price.

- Tempo-set Model A is approved in either open or closed circuit and the temperature ratings are 140 and 200 degrees.
- Approved spacing is 20' x 20'.
- Electric ratings are 125 volts 1 ampere, A.C. or 24 volts 0.5 ampere D.C., or less.

CENTRAL STATION SIGNALS, INC.

Manufacturers of all kinds of approved devices used in Central Station Systems or Class 'A' or Class 'B' Proprietary Fire Alarm Systems, either automatic or manual.

53 WEST 23rd STREET **NEW YORK 10, N. Y.**

Bump that assures positive results

When fire strikes, seconds count . . . your fire extinguishers must be the right type and function properly from the very start . . . failure means serious losses.

The growing popularity of the highly effective powdered dry chemical fire extinguishing agent may be hampered by a drawback . . . settling or packing can occur after a lapse of time. However, with C-O-TWO Dry Chemical Type Fire Extinguishers, there is no chance of this happening.

The exclusive inverting and bumping design of C-O-TWO Dry Chemical Type Fire Extinguishers provides mechanical breakage of the dry chemical by shifting its position in the cylinder. This outstanding mechanical breakage, plus continuous inert gas pressured agitation or fluffing of the skillfully blended dry chemical, guarantee lasting, foolproof fire protection.

No other brand on the market today gives you this extra margin for positive results. Inverting and bumping is only one of many unique design advantages that make C-O-TWO Dry Chemical Type Fire Extinguishers your best buy for killing flammable liquid and electrical fires, as well as surface fires involving ordinary combustible materials.

With C-O-TWO Dry Chemical Type Fire Extinguishers the heat-shielding dry chemical is a non-conducting, non-abrasive, non-toxic, finely pulverized powder compound . . . blankets fire instantly. Sizes range all the way from 4 to 150 pounds capacity . . . all fully approved by the Underwriters' Laboratories, Inc., Factory Mutual Laboratories and Government Bureaus.

Act now for complete free information on these top quality, sure-acting fire extinguishers. Remember fire doesn't wait . . . get the facts today!

C-O-TWO

MANUFACTURERS OF
APPROVED FIRE PROTECTION EQUIPMENT
Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
Built-in High Pressure and Low Pressure Carbon Dioxide Type Fire Extinguishing Systems
Built-in Smoke and Heat Fire Detecting Systems

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C-O-TWO FIRE EQUIPMENT OF CANADA, LTD.
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AFFILIATED WITH PYRENE MANUFACTURING COMPANY

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CENTRAL SPRAY SPRINKLERS

Central Upright Spray Sprinkler Type "SSU"

BETTER FIRE PROTECTION

Combining all the superior features of the Central conventional type of automatic sprinklers (which 34 years of unequalled service have demonstrated) with the Central specially designed spray type of distributors, we present the complete line of Central Spray Sprinklers.

Central Spray Sprinklers are more effective and more efficient than any other type of sprinkler.

CHEAPER COST OF INSTALLATION

Their greater area of distribution and their lesser consumption of water combine to produce earlier extinguishment of fires with less water used, smaller pipe sizes and, in most cases, a lesser number of sprinklers required for the same areas.

Therefore, you save money in first installation cost and your fire damage is lessened if a fire occurs.

In every way, you profit by using the latest developed and the most efficient Central Spray Sprinklers.

Manufactured and Installed by

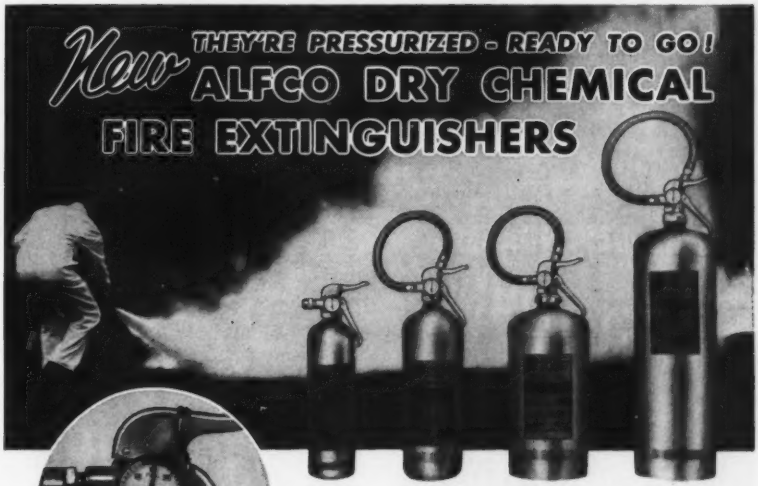
CENTRAL AUTOMATIC SPRINKLER COMPANY

Fourth Street and Cannon Avenue, Lansdale, Pa.

Cable Address — "Sprinklers" — Philadelphia

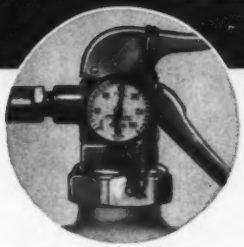
Licensees in principal cities in U. S. of America and Canada and throughout the world.

New THEY'RE PRESSURIZED - READY TO GO! ALFCO DRY CHEMICAL FIRE EXTINGUISHERS



PDC-5 PDC-10 PDC-20 PDC-30

Unmatched in Fire Smothering Efficiency!



A glance at valve gauge indicates whether unit is in operating order.

WHEN FIRE HITS, THESE NEW ALFCO DRY CHEMICAL MODELS ARE READY TO STOP IT

With Valve and Siphon Assembly removed as single unit, ample size opening is provided for charging.

Simply pull pin and squeeze lever. No gadgets to operate, no last minute pressurizing from a gas cartridge or cylinder, no inverting, no bumping, no shut-off nozzle on the hose needed. They're ready to go!

Their fire-smothering efficiency is aided by a scientifically designed Alfco Discharge Nozzle which fans the Dry Chemical outward and downward in wide pattern and with great density. Their 150 (plus 25 minus 0) psi. air (or nitrogen) pressure maintains an excellently uniform duration of the Alfco Dry Chemical discharge pattern.

When partially operated, they can be left standing without loss of air pressure.

The Alfco Dry Chemical Valve is completely new also. It is ruggedly built. No special tools needed. Contains few parts. Equipped with Safety Relief Valve. Complete valve and siphon tube assembly removes as a single unit for recharging. They're water-tight, and noncorrosive. Tested for vibration and for operation at temperatures from minus 40° F. to plus 150° F. An Alfco Moisture Trap provides for pressurizing with air.

Write us for illustrated literature and full details of their special features.

Model numbers designate the capacities by weight of Dry Chemical.
Approved by Underwriters' Laboratories for Class B and C Fires.

Our 2nd Century of Leadership in FIRE PROTECTION

AMERICAN LAFRANCE-FOAMITE Corporation

ELMIRA NEW YORK, U.S.A.

IN CANADA: LAFRANCE FIRE ENGINE & FOAMITE LTD. TORONTO

ALFCO

ANSUL
FIRE EXTINGUISHING EQUIPMENT

FASTER . . . A short, quick downward motion of the puncture lever pressurizes the extinguisher and it is ready for instant use.

MORE EFFECTIVE . . . Even the inexperienced operator gets near-expert results because of the ease of operation and handling. In addition ANSUL *"PLUS-FIFTY"* Dry Chemical has greater fire-killing power.

MORE DEPENDABLE . . . Exclusive ANSUL-ENGINEERED design features include water-tight and corrosion-resistant construction, easy, on-the-spot recharge without special tools and other exclusive Ansul developments which insure greater dependability.

FIRE-STOPPING POWER . . . ANSUL FIRE EXTINGUISHERS have the highest ratings for fire-stopping power ever awarded any type of class B and C fire extinguishing equipment.

Send for File No. B-218. You will receive a variety of helpful printed matter. Included is our latest catalog which describes Ansul Extinguishers of all sizes — from the small Ansul Model 4 to Ansul Piped Systems and Ansul 2000 lb. Stationary Units.

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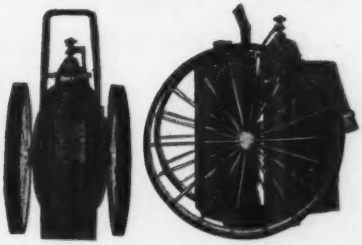
ANSUL
PROVIDES THE MOST COMPLETE LINE OF DRY CHEMICAL
FIRE EXTINGUISHING EQUIPMENT

HAND PORTABLES

MODEL 4-C MODEL 20-B MODEL 30-B

NEW WHEELED PORTABLES



MODEL 150-B MODEL 350-B

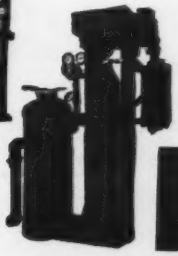
In Ansul's complete line of Fire Extinguishing Equipment there is a model of just the right size to adequately protect nearly every type and area of class B and C fire hazards in, or around, your plant. And, more important, even the largest capacity of wheeled portable and stationary equipment by Ansul, is designed for quick, easy, one-man operation. Ansul Fire Extinguishers are designed for maximum effectiveness even when used by inexperienced employees. They are easy to operate and can be quickly recharged "on-the-spot." No special tools are required for recharging, inspection or maintenance. In addition, all Ansul Equipment is water-tight and corrosion-resistant for longer, trouble-free service.

TRUCK MOUNTS, TRAILERS AND FIRE TRUCKS

MODEL J1-340

MODEL S-2000-B

STATIONARY EXTINGUISHERS AND PIPED SYSTEMS



PIPED SYSTEM

ANSUL Chemical Company

FIRE EQUIPMENT DIVISION • MARINETTE, WISCONSIN

MANUFACTURERS OF DRY CHEMICAL FIRE EXTINGUISHING EQUIPMENT, REFRIGERATION PRODUCTS, INDUSTRIAL AND FIRE CHEMICALS AND LIQUEFIED GASES

GLOBE
SAVEALL
SPRINKLER

PRODUCT OF THE CHEMICAL AGE

FOR NEW INSTALLATIONS
FOR REPLACEMENT OF EXISTING SPRINKLERS

UPRIGHT

SOMETHING
NEW
•
SOMETHING
DIFFERENT
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FIREMEN
EVERY
10 FEET

PENDENT

SAVEALL AUTOMATIC SPRAY SPRINKLERS
APPROVED BY ALL INSURANCE AUTHORITIES

Fifty-five years experience in manufacturing automatic sprinklers enables us to produce the Saveall Automatic Spray Sprinkler, the last word in appearance, sensitivity, durability, efficiency, quality, accuracy of performance.

Illustrated pamphlet available on request.

Manufactured and Installed by
GLOBE AUTOMATIC SPRINKLER COMPANY
Philadelphia, Pa.
Offices in Principal Cities

A GALLERY OF INFORMATION AT YOUR FINGERTIPS

These recent publications of the Safe Manufacturers National Association are yours for the asking.

Within their pages are revealed a wealth of technical information—and the most up-to-date and authoritative guides to the safekeeping of records.

Fire is the No. 1 enemy of your vital records. You owe it to yourself to learn how YOUR records may be protected.

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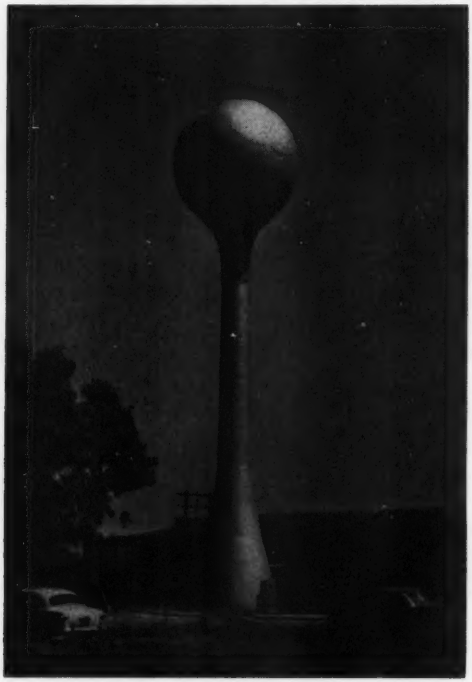
SAFE MANUFACTURERS NATIONAL ASSOCIATION, Inc.
366 MADISON AVE., NEW YORK 17, N. Y.

HORTON WATERSPHERE

Protects Truck Company Plant From Fire



This 50,000-gal. Watersphere provides gravity water pressure for fire protection at the Hendrickson Motor Truck Company in Lyons, Ill. The company was organized in 1931. It manufactures motor trucks, tandem axle units, split shaft power take-offs and other special truck equipment.

Fire at the plant would practically put the company out of business. It supplies parts to some of the larger truck manufacturers. In case of a disastrous fire, these customers would have to make the parts themselves to keep their production lines going. After a truck manufacturer has established his own facilities, it would be difficult for Hendrickson to get his business back again.

The plant is over 4 acres in area. It consists of two buildings — one built in May, 1948, and the other in May, 1951 — with 84,000 sq. ft. of floor space. The sprinkler system has over 800 sprinkler heads. According to Mr. Edward D. Hendrickson, the tank and sprinkler system can be paid for in less than 10 years by savings in insurance premiums.

The Watersphere was pickled by the Horton phosphoric acid process to remove the mill scale.

CHICAGO BRIDGE & IRON COMPANY

CLEVELAND	CHICAGO	BIRMINGHAM	LOS ANGELES
HOUSTON	DETROIT	ATLANTA	PHILADELPHIA
SEATTLE	HAVANA	NEW YORK	PITTSBURGH
BOSTON	TULSA	SALT LAKE CITY	SAN FRANCISCO

Plants at Chicago, Birmingham, Salt Lake City and Greenville, Pa.

The AMAZING New

Star Spray Sprinkler!

(MODEL C—UPRIGHT)

With its

Unequalled Performance

Gives You . . . . . .

SUPERIOR PROTECTION — revolutionary in method — for any type of occupancy — no matter how severe the hazard . . . . . with **LESS WATER USED** — more effectively and more efficiently — for total extinguishment and cooling. . . . All water discharged goes directly on the fire — not on the ceiling. . . . Ceilings are so cooled that no sprinkler will open unnecessarily. . . . . **STAR SPRAY SPRINKLERS** — the ultimate in modern fire protection — can replace former-type sprinklers without changes in piping. . . . . Available for installation in either **UPRIGHT** or **PENDENT** position.

Approved by Factory Mutual Laboratories
Listed by Underwriters' Laboratories, Inc.

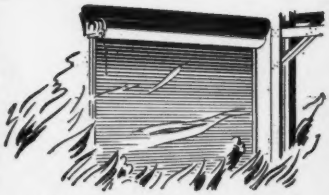
Write for name and address of STAR licensed contractor nearest your location, to:

STAR SPRINKLER CORP.

Westmoreland and Collins Sts. — Philadelphia 34, Pa.

Licensees in all Principal Cities of the United States and Canada

"Akbar"—the famous Kinnear Rolling Fire Door



Automatically BLOCKS the Spread of fire

Safety Features Give Building Occupants EXTRA Protection

You get *positive, automatic* fire protection at doorways, windows and other openings with Akbar Fire Doors. They're *pushed* downward by a strong spring . . . *controlled* in downward speed by a special safety device . . . and operable in emergency *after* automatic closure. Coiled out of the way overhead when not in use, they lower quickly into place when fire threatens, cutting off drafts and confining flames to small areas. Approved by Underwriters' Laboratories, they are built in any size. Kinnear Rolling Fire Doors can also be equipped for daily service with motor or manual operation. (Non-labeled Kinnear Rolling Doors are preferred for service use where maximum fire protection is not required.) Write!

The KINNEAR Manufacturing Co.

Factories: 2250-70 Fields Ave., Columbus 16, Ohio; 1742 Yosemite Ave., San Francisco 24, Cal.

Offices and Agents in All Principal Cities

SAVING WAYS for DOORWAYS

KINNEAR ROLLING DOORS

Like an evil eye, fire is constantly on the lookout for unprotected hazards such as flammable liquids, electrical equipment, materials in process. For protection that never sleeps, recommend Kidde Automatic Fire Extinguishing Systems.

Kidde

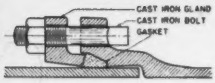
The words 'Kidde', 'Fyre-Freez' and the Kidde seal are trademarks of Walter Kidde & Company, Inc.

Walter Kidde & Company, Inc.
451 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

MECHANICAL JOINT HYDRANT

EASY to INSTALL

Saves Labor
Saves Time



Made-up Mechanical Joint cut away to show its design.

UL&FM APPROVED & LISTED

The use of mechanical joints for pipe, valves and hydrants is growing rapidly. The reasons are easy assembly, saving in time and labor cost, and flexibility that maintains a tight, leak-proof joint under conditions such as pipe line expansion, contraction or settling.

M & H Mechanical Joint hydrant is standard compression type. The main valve opens against the pressure. Hydrant valve will remain closed in case hydrant standpipe is broken off in traffic accident. Other features include low friction loss, revolving head, dry top, easy lubrication. Hydrant shoe has two heavy lugs for use in strapping hydrant to dead-end pipe line.

M & H Hydrants are approved and listed by Underwriters' Laboratories of Chicago and Factory Mutual Laboratories of Boston. Mechanical Joint Ends are made in accordance with A.S.A. standard specification A21.11, 1952, in which a thick gasket of triangular cross section is compressed by a bolted follower ring.

For complete information, write or wire M & H VALVE AND FITTINGS COMPANY, Anniston, Alabama.

M&H PRODUCTS FOR WATER WORKS • FILTER PLANTS INDUSTRY • SEWAGE DISPOSAL AND FIRE PROTECTION

30%
GREATER COVERAGE

with GRINNES
AUTOMATIC *Spray* SPRINKLERS
for fire protection

* 20% to 30% FEWER SPRINKLERS REQUIRED PER AREA.
* MORE UNIFORM LATERAL DISTRIBUTION OF WATER.
* EXTINGUISHES FIRE FASTER WITH LESS WATER.
* MORE EFFECTIVE CEILING PROTECTION.
* MINIMIZES FIRE AND WATER DAMAGE.
* INTERCHANGEABLE WITH CONVENTIONAL SPRINKLER HEADS.

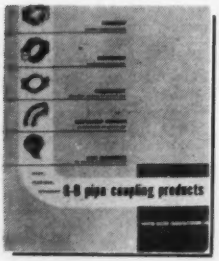
RAISLER
SPRINKLER DIVISION • RAISLER CORPORATION

Use ROLAGRIP couplings for fast, low cost sprinkler installation

This is a 6" ROLAGRIP coupling for plain end pipe on a sprinkler bulk line in a midwestern aircraft plant. ROLAGRIP couplings and plain end steel pipe were used here because the contractor had to install a permanent, low cost sprinkler system *in a hurry.*

Because the sprinkler system was coupled with ROLAGRIPS, pipe came straight from the mill in economical mill run lots . . . ready to install. It required no special machining, handling or shipping preparation.

Installation time and labor were cut because ROLAGRIPS go on in three easy steps: (1) grease the special synthetic rubber gasket (to prevent pinching) and center it over the pipe ends; (2) lay ROLAGRIP halves over gasket; and (3) insert and tighten two bolts.



Chances are, ROLAGRIPS will save you time and money, too. They come in 1½" to 12" sizes; are approved by Factory Mutual and Underwriters' Laboratories.

Write for free folder!

See ROLAGRIPS at your supply store this week. (For grooved pipe, ask for GRUVAGRIPS and GRUVAGRIP FITTINGS — sizes ¾" to 14".) Or write today for prices and free illustrated folder No. NCF.

GUSTIN-BACON MANUFACTURING COMPANY

210 West Tenth Street **Kansas City 6, Missouri**

Your Company's Future May Depend on
THE RIGHT PROTECTION

FIRE TESTED

Be Sure It's-

AER-O-FOAM

The only Foam to carry this seal!

THERE'S NO second chance with fire. So guard your flammable-liquids risks with *fire-tested* AER-O-FOAM. This is the foam that is tested on actual oil or solvent fires—every batch of it. Its tough blanket of fire-killing foam has *already* extinguished a fire when you buy it!

Three fire-tested AER-O-FOAM products give you complete protection for flammable liquid fires—6% Regular Liquid and 3% Regular Liquid for petroleum fires, and AER-O-FOAM "99" for either polar solvents or petroleum fires. Write for data on AER-O-FOAM products and devices . . . Foam Chambers, Dip-tank or Drain-board Systems, Nozzles, Extinguishers, Trucks, Towers.

JUST OUT—"Foam Fire Protection," illustrated booklet on what Foam is, what it does, how it works. Yours free.

NATIONAL
FOAM SYSTEM INCORPORATED
Headquarters for Foam Fire Protection — WEST CHESTER, PA.

- Dependable water supply
- Constant fire protection

SERVING EVERY INDUSTRIAL NEED

Ford Motor Company, Cleveland, Ohio. 750,000-gallon Radial Cone Bottom Tank. Diameter 73'; head range 25'; height to bottom 100'.

Ford Motor Company, Hamburg, New York. 250,000-gallon Double Ellipsoidal Tank. Diameter 38'; head range 33'; height to bottom 123'.

PITTSBURGH-DES MOINES

Elevated Steel Tanks

These recently-erected tanks, serving the water storage requirements of two new Ford Motor Company plants, typify the hundreds of industrial PDM Elevated Steel Tank installations for companies of every size from coast to coast. Let us consult with you on the type and capacity of tank best meeting the demands of economy, efficiency and safety for your plant.

PITTSBURGH • DES MOINES STEEL CO.

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH (25), . . 3468 Neville Island
NEWARK (2), . . 250 Industrial Office Bldg.
CHICAGO (3), 1272 First National Bank Bldg.
DES MOINES (8), . . 969 Tuttle Street
DALLAS (1), . . 1273 Praetorian Building
SEATTLE . . . . 576 Lane Street
SANTA CLARA, CAL. . 675 Alviso Road

FIRE BAN

PERMANENT • FIRE RETARDANT

SURFACE COATING

For surface application on cork and cellulose boards, unpainted rough wood, fibre and foam glass sheets, blocks, pipe covering, insulation, etc. Applied by brush, spray or trowel.

Listed by Underwriters' Laboratories Inc.

FIRE-BAN is NOT a paint, but a 100% inert mineral composition that will not in itself burn and prevents ready ignition of other combustible materials. Economical enough for low cost construction . . . Easily applied to present buildings . . . Suitable for either interior or exterior application . . . Positive protection against vermin and fungi . . . Needs no reinforcing; weighs only 6½ ounces per sq. ft. when applied 1/16" thick . . . May be applied up to ¼" thick.

Combustible materials cannot be made incombustible but an application of **FIRE-BAN** will delay the ignition of combustible construction materials and prevent small fires from quickly spreading. This valuable time retardant will save lives and permit fires to be extinguished. A coating of **FIRE-BAN** on the surface of rigid boards provides a smooth self-supported, seamless monolithic surface, that will not peel, craze or crack of its own volition, and seals the air from combustible materials retarding its combustion. Resistant to extreme temperatures. Available in colors. Permanently washable. Thoroughly 'field tested' for over six years.

FREE SAMPLES

Samples of Fire-Ban applied to wood, fibre or cork board supplied upon request. Please specify.

Fire Protection Engineers, Inspectors, Architects, etc., can obtain samples of *Fire-Ban* with instructions for experimental use . . . no charge or obligation. Write for Bulletin 22 or outline your problem.

E. H. O'NEILL FLOORS COMPANY

2525 South 50th Ave. Cicero 50, Illinois

REVOLUTIONARY

news about fire protection!

SEND FOR THIS *FREE* BOOK!

GET THE FACTS about the sensational new Rockwood WaterFOG Sprinkler Heads!

Find out how you can now apply powerful fire-fighting WaterFOG to *conventional* sprinkler systems. Take advantage of a speedy fire control that discharges millions of tiny water particles *away* from ceiling, right down into the flame area. See how gas and flames are prevented from mushrooming and needlessly opening adjacent heads. Learn how these new heads provide a cooling wall that blocks gas and flames from ceiling — how they use less water, reduce fire-and-water damage, save costly production time.

Rockwood's illustrated booklet "From Navy Fire Fighting to Better Sprinklers" brings you complete details on this amazing new Rockwood product. A result of years of research, Rockwood TU-57 and TP-57 heads are given a 30% increased fire coverage over ordinary heads by *insurance authorities*. Worth reading about. Worth specifying. Mail coupon today for your free copy.

ROCKWOOD
SPRINKLER COMPANY

Engineers Water . . .
to Cut Fire Losses

ROCKWOOD SPRINKLER COMPANY
56 Harlow Street, Worcester 5, Mass.

Please send me your illustrated booklet on WaterFOG Sprinkler Fire Protection.

Name.....

Title.....

Company .....

Street.....City.....Zone.....State.....

Automatic Rolling Steel
FIRE DOORS *and* WINDOW SHUTTERS
PREVENT SPREAD *of* FIRE!

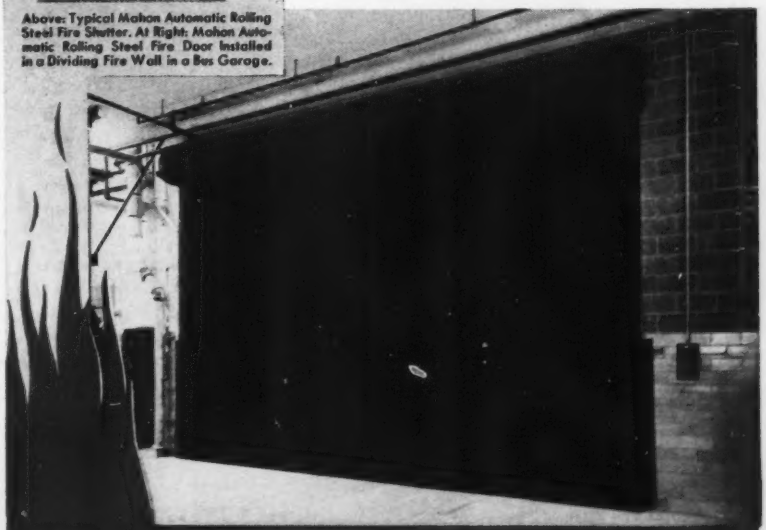
You need good automatic fire doors in fire walls, corridors, and vertical shafts . . . in some cases automatic rolling steel window shutters are necessary to protect your building and its contents from fires which may originate in nearby buildings. Many, many cases are on file which confirm that timely action of automatic rolling steel fire doors and window shutters have confined a fire to its point of origin and permitted its being extinguished with comparatively small damage. Make a survey of your building now, and don't delay action. You will find a Mahon Automatic Rolling Steel Fire Door or Window Shutter to meet each of your requirements—all bear the Underwriters' Label. These automatic fire doors may be operated manually or mechanically in every day use. If a fire should break out while they are in the open position, the automatic mechanism will close the door, cutting off drafts and preventing the spread of the fire. See Sweet's Files for complete information, or write for Catalog 654.

THE R. C. MAHON COMPANY

Detroit 34, Michigan • Chicago 4, Illinois

Manufacturers of Automatic Rolling Steel Fire Doors and Window Shutters. Also Many Types of Standard General Service Rolling Steel Doors and Grilles, Insulated Metal Walls, and Steel Deck for Roofs, Floors and Partitions.

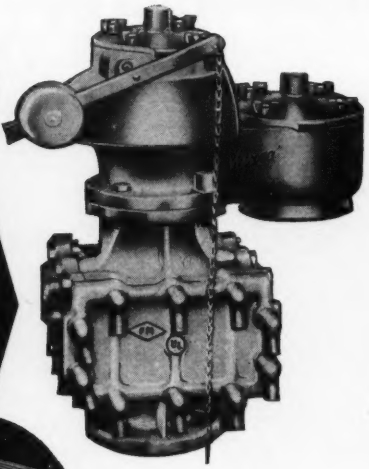
Above: Typical Mahon Automatic Rolling Steel Fire Shutter. At Right: Mahon Automatic Rolling Steel Fire Door Installed in a Dividing Fire Wall in a Bus Garage.

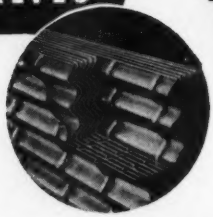


MAHON ROLLING STEEL FIRE DOORS and WINDOW SHUTTERS

WHEN STORING FLAMMABLE LIQUIDS IT PAYS TO BE

EXTRA **Safe** with "Varec" FLAME ARRESTERS In combination with your VENT VALVES





"VAREC" Fig. No. 5800 Vent Unit consisting of "VAREC" Conservation Vent Valve in combination with "VAREC" Flame Arrester.

The belief that conservation vents or breather valves alone will prevent travel of flame back into flammable liquid storage tanks is questionable because of the many contributing factors. Careful authoritative analysis reveals that valves by themselves do provide *some protection* but this "protection" *is by no means adequate* under all circumstances.

Safety authorities emphatically advise that "vent valves are not regarded as providing the required protection against fire and explosion." A textbook on safety states that "a conservative policy is to provide flame arresters in conjunction with other vent equipment on all cone-roof atmospheric tanks handling oils with a flash point up to 200°F open cup."

"VAREC" Flame Arresters when used as a unit with "VAREC" Vent Valves give you full fire protection at extremely low cost. Average installations run approximately .1 of 1% of your investment in tank and products. Consult your nearest "VAREC" representative or write for further information.

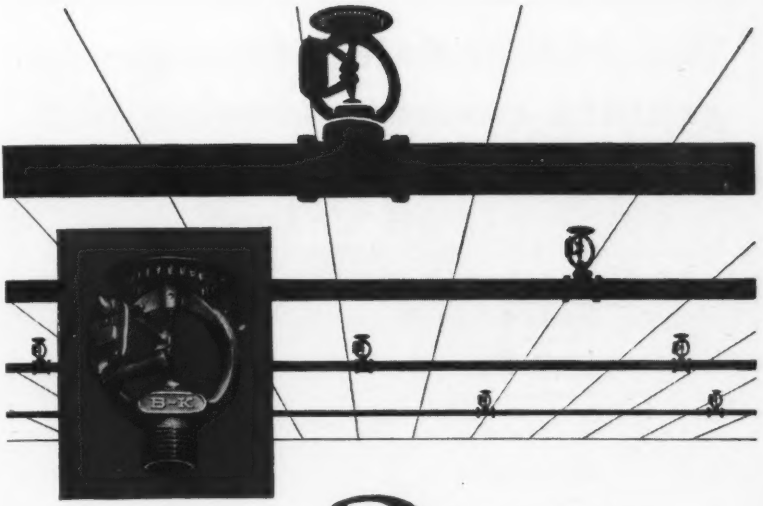
THE VAPOR RECOVERY SYSTEMS COMPANY

COMPTON, CALIFORNIA, U. S. A.

Cable Address: VAREC COMPTON USA (All Codes)

NF-1

PROVED and APPROVED "Varec"



consider but 2 basic factors . . .

. . . when you think of fire protection, the selection of the very best of mechanical devices and—the engineering of these devices into an automatic system which will provide the maximum protection against your specific hazard.

Both are important. The finest of both are to be had at Blaw-Knox.

Through more efficient distribution of water, the new Blaw-Knox Spray-Head provides greater fire control with less water. Carefully engineered into a system by Blaw-Knox's specialists in industrial fire protection, these Spray-Heads are the most effective means of quenching fire, confining damage and protecting adjacent areas.

No cash outlay is required, and the system will pay for itself in reduced insurance premiums within a few years. Let a Blaw-Knox Fire Protection Engineer study your needs and submit an estimate . . . absolutely without obligation.

BLAW-KNOX FIRE PROTECTION SYSTEMS CARRY APPROVALS OF ALL INSURANCE UNDERWRITERS.
• Deluge Systems • Wet Pipe Systems • Dry Pipe Systems • Water Spray and Fog Systems • Rate-of-Rise Sprinkler Systems • Foam and Carbon Dioxide Extinguisher Systems

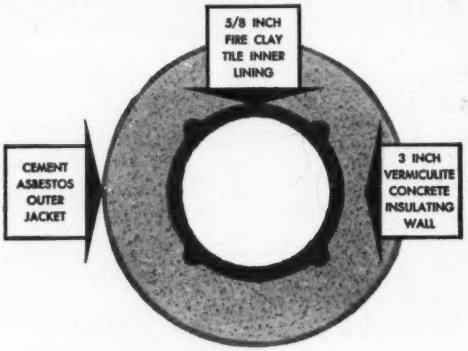
You'll be interested in the new Blaw-Knox booklet, "FIRE CAN DESTROY YOUR BUSINESS." Write for it.

"Little Joey Sprinkler" always on the job

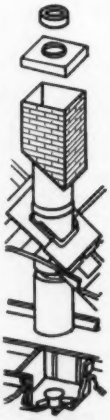
BLAW-KNOX COMPANY

Automatic Sprinkler Department / Pittsburgh 33, Pa.

Van-Packer Safety Chimney is genuine masonry construction



Cross-section view shows all masonry construction



Withstands 2100° F.—The Van-Packer Packaged Masonry Safety Chimney is built with a 5/8" fire clay tile liner (the *only* material proven safe by fire safety men thru the years). The liner will withstand temperatures in excess of 2100° F.

Safety of 24" Brick Wall—Van-Packer's 3" insulating concrete wall is equivalent to a 24" brick chimney wall, so safe that wooden rafters can be in direct contact with chimney (Underwriters tested and so listed). Section joints are permanently sealed with acid-proof, leak-proof joint cement.

Approved for All Fuels—FHA accepted, UL listed, and approved by major codes and U. S. Army Engineers for all fuels: coal, oil and gas.

For further information on the Van-Packer Chimney write for Bulletin No. 41D-AF28

Van-Packer

Packaged Masonry Safety Chimney with "Brick-Panel" Housing

Van-Packer Corp. • 209 S. LaSalle St. • Chicago 4, Illinois

DO YOU GET THIS KIND OF FOAM

from your AIR FOAM System?

This photomicrograph is the revealing secret of **NICEROL** *AIR FOAM'S TRULY AMAZING heat stability*

THIS IS WHY NICEROL GIVES GREATER HEAT RESISTANCE

The minute, closely-knit bubbles retain the maximum water content in a foam that is both adhesive and cohesive. This is the reason that Air Foam, made from Nicerol, defies fire breakdown, puts out more fire faster, and definitely outlasts the fire to prevent flashbacks.

NICEROL Air Foam Liquid lasts longer in the can, too, because it is specially processed to prevent corrosion of cans and containers—nor does it form sludge.

NICEROL Air Foam Liquid can be used with all approved types of air foam systems and nozzles.

NICEROL is more widely used throughout the world than any other air foam liquid.

SPECIAL TESTING OFFER

Simply write the one word "SAMPLE" on your official stationery and we will send to you: Freight pre-paid, anywhere in the U.S.A. or Canada, one 5-gallon can of NICEROL Double strength Air Foam Liquid, for $20 C.O.D. (or please enclose check). Test this sample can through your existing foam system—to produce 1,650 gallons of tough foam from only 165 gallons of water, fresh or salt.

The $20 cost of this sample will be deducted from your first order for NICEROL of 100 gallons and over.

Nicerol

THE LONGER LASTING AIR FOAM

Keeps longer in storage—Puts out more Fire Faster Outlasts the Fire

INQUIRIES INVITED FROM DISTRIBUTORS AS WELL AS USERS. FULL TECHNICAL AND COMMERCIAL DETAILS AVAILABLE FROM

GEORGE T. REYNOLDS & ASSOCIATES, P.O. BOX 395, THORNWOOD, N.Y., U.S.A.

BRITISH FIRE EXTINGUISHERS LTD., 222 SIMCOE ST., TORONTO 2B, ONT., CANADA

NOTHING LEFT TO CHANCE

Every design detail of Shand & Jurs Internal Hydraulic Safety Valve systems contributes to maximum **safety.** Note the weakness groove built into this S & J Safety Valve elbow. Should an accident tear away discharge lines, the elbow will break away along this groove. The Internal Valve will remain firmly seated, and it will not allow any discharge of the tank contents.

When you sum up these safety features of S & J Internal Safety Valve systems: positive hydraulic opening action—internal valves normally held closed by internal spring pressure — fusible plugs inserted in hydraulic lines which melt at 165° and release hydraulic pressure in case of fire, allowing any open valve to close instantly — and the weakness groove in the elbow which precludes unseating of the internal valve due to accident—you'll readily see that the design of S & J Internal Hydraulic Valves leaves NOTHING TO CHANCE.

Shand and Jurs Co.
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342 Madison Ave.

HOUSTON
3277 Main St.

TULSA
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10409 S. Western Ave.

LOS ANGELES
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REPRESENTATIVES:
SEATTLE: Nelson Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialists, Ltd., 360 Notre Dame St., W.
TORONTO: Lytle Engineering Specialties, Ltd., 85 Richmond St., W.
VANCOUVER: P. D. Wilcox & Son, Ltd., 3277 Main Street
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RELIABLE SPRAY SPRINKLER

RELIABLE
● Greater Coverage!
● Lower Ceiling Temperatures!
● Faster Cooling of Hot Fire Gasses!
● Better Fire Extinguishment with Less Water!
● Fewer Sprinklers Operating Adjacent to Fire Area!

Incorporating the new principle of water distribution, the Model "C" Spray Sprinkler is another example of Reliable's leadership in new product design. All Reliable Sprinkler Devices are the assurance of the ultimate in fire protection . . . and have been protecting life and property for over 30 years! Reliable Sprinkler Devices are distributed . . . installed and serviced by Reliable's chain of licensed representatives located throughout the United States, Canada and foreign countries. A Reliable representative is as near as your phone. . . . Call him for a system designed to your specific needs!

Constant Fire Protection That's Always "Reliable"!

THE RELIABLE AUTOMATIC SPRINKLER CO. INC.

UPRIGHT

PENDENT

the perfect squelch

you can't buy better fire protection than **VIKING**

The **NEW** *Viking Spray Sprinkler*

Here's the perfect squelch for fires — The new VIKING Spray Sprinklers offer an improved method of fire control. In tests VIKING Spray Sprinklers have proved much more efficient than conventional heads in controlling fires of various types.

Seven VIKING features give you economy with full protection, with (1) better water distribution, (2) better cooling characteristics, (3) fewer sprinklers operating, (4) more economical use of water, (5) greater ceiling protection, (6) fewer sprinkler heads needed, and (7) VIKING Spray Sprinklers can replace conventional sprinklers without changing piping.

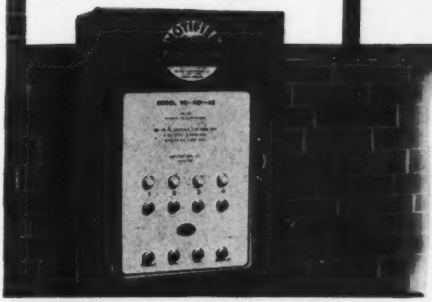
the VIKING corporation

HASTINGS, MICHIGAN

Offices in Principal Cities

Newest Complete U.L. Listed Auxiliary Fire Alarm System

NOTIFIER



NU-01-AD Series Auxiliary System

1954's most practical fire protection for institutions, industry and business. Consult Notifier and solve your fire hazard problems. Free information on request. Efficient engineering service.

ACT NOW!

Dealer Franchises Available

. . . for either HOME or COMMERCIAL sales to those who meet Notifier standards.

Seconds Count in Fire Detection and Notification

For the first time, Notifier has completely eliminated the element of HUMAN ERROR and TIME LOSS in detecting and reporting fires. The Notifier Auxiliary Alarm System provides 100 per cent supervision all the way from each thermostat in the protected building to the fire station receiving panel.

Every operation is automatically and electrically supervised and controlled to give instant notification to the fire station without possibility of mis-judgment or loss of time in re-transmittal.

A MARVEL OF ENGINEERING

Simplified two conductor installation. Completely supervised against opens and AC power failures. If AC power fails, system works on DC for many days before batteries wear out. Sturdily constructed; will last the lifetime of a building.

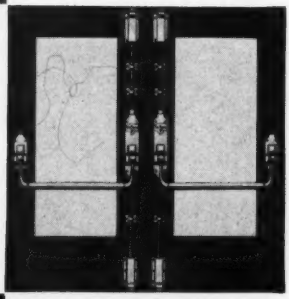
Write Dept. Q-2

NOTIFIER MANUFACTURING CO.

239 South 11th St. Lincoln, Nebraska

Get your exits

ready for increased traffic



Call in your

Von Duprin
"EXIT SPECIALIST"

● Increased production for your plant means more employes, more traffic, more need than ever for safe, dependable exits. Call in your Von Duprin "Exit Specialist" for a free survey of your exit requirements. From actual experience, he can recommend the right Von Duprin exit devices to give you the greatest safety and service. Von Duprin is the most complete line of approved exit devices. From this one line, you can meet *all* your present and potential exit hardware needs. If you don't know the name of your nearest "Exit Specialist," write Von Duprin.

FREE Reserve a showing of Von Duprin's 20-minute sound movie, "Safe Exit." Build a lively safety program around this interesting public service film. Write for a booking.

VONNEGUT HARDWARE CO. • VON DUPRIN DIVISION • INDIANAPOLIS

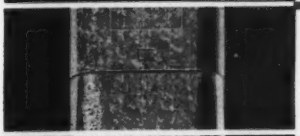
Von Duprin Fire and Panic EXIT DEVICES

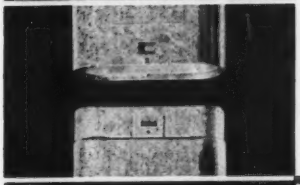
THE SAFE WAY OUT!

NOW!
SAFER - BETTER - LOWER COST VENTING with
WV METALBESTOS

NEW EASY-TO-INSTALL OVAL GAS VENT PIPE

- Listed by Underwriters' Laboratories as **both** a Type B and Type BW gas vent pipe.





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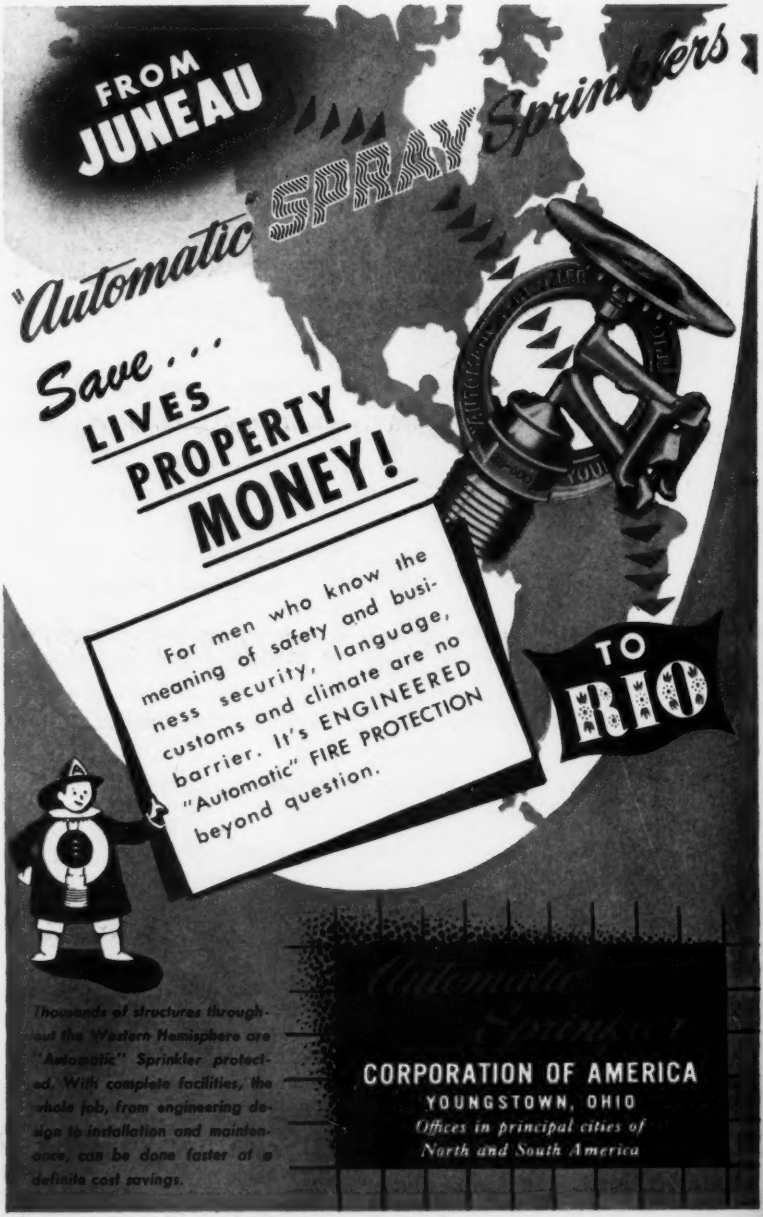
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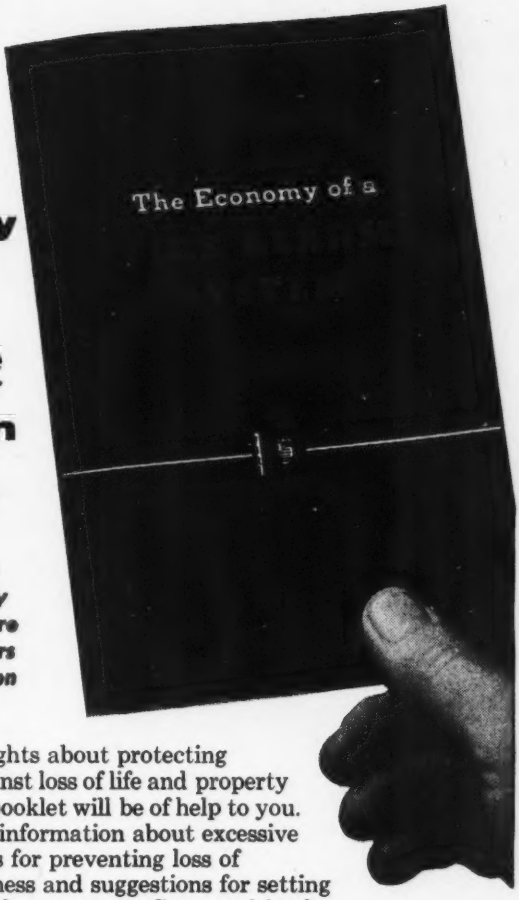

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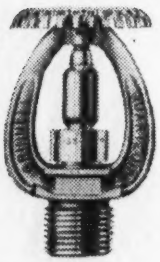

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